MEDICAL LIBRARY

SEP 8 1949

VOLUME 48 NUMBER 6

ARCHIVES OF

OTOLARYNGOLOGY

EDITORIAL BOARD

GEORGE M. COATES, Chief Editor
1721 Pine Street, Philadelphia 3

WESTLEY M. HUNT, New York
RALPH A. FENTON, Portland Ore.
ERNEST M. SEYDELL, Wichita, Kan.
CHEVALIER JACKSON, Philadelphia
ROBERT L. GOODALE, Boston
J. MACKENZIE BROWN, Los Angeles
CARL H. McCASKEY, Indianapolis

DECEMBER 1948

PUBLISHED MONTHLY BY AMERICAN MEDICAL ASSOCIATION, 535 NORTH DEARBORN STREET, CHICAGO 10, ILLINOIS. ANNUAL SUBSCRIPTION, $10.00

Entered as Second Class Matter Jan. 14, 1925, at the Postoffice at Chicago, Under the Act of Congress of March 3, 1879

COPYRIGHT, 1949, BY THE AMERICAN MEDICAL ASSOCIATION

ARCHIVES OF OTOLARYNGOLOGY

VOLUME 48 DECEMBER 1948 NUMBER 6

COPYRIGHT, 1949, BY THE AMERICAN MEDICAL ASSOCIATION

ESTROGEN, BONE METABOLISM AND OTOSCLEROSIS

EDMUND PRINCE FOWLER, M.D.
NEW YORK

BECAUSE of its high incidence (over 10,000,000 in the white population of the United States [1]) and the meager knowledge as to its origin and control, otosclerosis is the number one mystery in otologic research. Any information suggesting a lead for solution should be carefully investigated. I invite attention at this time to some leads which seem to have been generally ignored.

For many years it has been known that certain sex-linked episodes frequently coincide with the onset or an increase of the deafness caused by otosclerosis, but no experimental explanation of the phenomena has been obtained or, in fact, even seriously attempted. In this article I am suggesting an explanation, which involves the sex hormones, and in particular the estrogens. The data and the argument are submitted tentatively and largely as suggestive for future research.

The bony skeleton of all animals depends on many complimentary and antagonistic factors for its balanced growth, maturation, maintenance and variation under environmental and biologic exigencies. It is well known that some of the glands of internal secretion are major or mediating factors in bone metabolism, and particularly the roles of the pituitary, thyroid and parathyroid glands have been emphasized. It is not so well known that in experiments on animals the estrogens, even in the absence of the glands named, have shown profound effects on the metabolism of bone. Moreover, the implication of these results in certain disorders affecting the labyrinthine capsule has not been discussed.

Several metabolic and endocrine disorders of bone, which may involve the otic capsule, in some respects resemble the lesions of otosclerosis (Paget's disease, von Recklinghausen's disease, and so-called low calcium rickets in animals), but the consensus at present is that all these diseases show distinctive morphologic features which permit their differentiation. One outstanding difference is that none of these diseases involves the

Read before the American Otological Society, Hot Springs, Va., April 12, 1948.

1. A Report of Progress: Twenty Years Research in Otosclerosis, Progressive Deafness and Correlated Problems, 1926-1946, New York, Central Bureau of Research, American Otological Society, Inc., 1947.

capsule of the labyrinth alone. They affect other parts of the skeleton and only incidently the petrous bone, whereas otosclerosis has been observed only in the bones of the ear.

One explanation of this selectivity is that the bone of the labyrinthine capsule is unique in several respects. It is the hardest bone in the body. Its endochondral bone is the only bone in the human body that normally persists throughout life without change in structure. It remains after the second year of life stabilized in the structural form in which it originally developed, whereas its periosteal layer meanwhile undergoes internal reconstruction throughout life, as does the rest of the skeleton. Many primitive (embryonic) features persist—skeinlike bone (*Strähnenknochen*), globuli ossei and calcified cartilage rests. The blood supply is unique in some respects. Even in old age, or after prolonged disease causing a general debility or prolonged decubitus, the endochondral capsule of the labyrinth remains unaffected for years, although in the periosteal layer severe osteoporosis (porous bones) may develop, with its typical normal resorption of bone and reduced new bone formation with consequent larger marrow spaces and thinner trabeculae.

In osteosclerosis (marble bones) the reverse process occurs: namely, reduced resorption of bone and a normal or moderately increased new bone formation which results in smaller secondary marrow spaces and thicker trabeculae bordering them. Comparable changes occur in the labyrinthine capsule, and the endosteal and periosteal layers are thickened.

Osteosclerosis is a familial disease of the skeleton associated with recessive traits. Almost invariably it becomes apparent during periods of growth. It is frequently accompanied with dental caries. In the long bones the marrow cavities become narrowed or obliterated, giving the bone a marble-like appearance on a roentgenogram. The marrow of other bones is comparably but variously affected. Otosclerosis also is a familial disorder of bone, but it is a dominant trait.

Osteogenesis imperfecta is frequently associated with blue scleras and otosclerosis. It appears to be due to a congenital deficiency in the mesenchymal tissues of the body. Otosclerosis also is a disorder of the mesenchyme, frequently associated with blue scleras.[1]

The sex hormones, estrogens and androgens, are classified chemically as steroids. Estrogens are produced mainly by the ovaries and androgens by the testes. The innervation of the glands is both parasympathetic and sympathetic. Their interrelation with several of the other endocrine glands, especially the anterior lobe of the pituitary gland, is intimate and reciprocal.

Although other hormones also affect bone metabolism, the present discussion will be restricted almost entirely to the action of the estrogens.

Estrogens, like androgens, are manufactured by both sexes but in different proportions. Both are rapidly inactivated, principally in the liver, and excreted with diminished potency in the urine. In consequence, neither is stored in the body to any extent. Experimentally, the estrogens increase calcification of bone in both male and female animals and affect the growth of bone more than do the androgens. The texture of the bone is also affected, and the growth at the epiphysial-diaphysial junction is curtailed or restrained. This is one reason given for the fact that men are generally taller than women. Of all the hormones affecting bone metabolism, the estrogens vary most as between male and female.[2]

Administration of estrogens has been observed to cause replacement of the marrow cavities of the femurs of mice, birds, dogs and guinea pigs with endosteal bone, and comparable changes were observed throughout the skeleton with the exception of the bone close to the symphysis pubis.[3] This variable effect of estrogen on the pubic bone should not be ignored. The skeletal effects of estrogen are direct and not mediated by the anterior lobe of the hypophysis.[4] If the pelvic bone, through heredity or environment, can develop variable sensitivity to estrogens, or a suppression of certain typical (or ancestral) effects of estrogen, why not the temporal bone?

Studies in many laboratories have shown that essentially similar laws of inheritance and comparable types of endocrine action exist in birds and man. Riddle found that in birds endosteal bone formation occurs after administration of estrogens, even in the absence of the parathyroid glands,[4] and also despite simultaneous administration of an equal quantity of thyroxin.[5]

The effect of estrogenic substances on the metabolism of bone is not always in correspondence with the changes in the blood serum. Estrogens do and androgens do not increase the "bound" plasma calcium of pigeons and fowl, even in the absence of pituitary, thyroid or parathyroid glands; but, for some unknown reason, estrogens do not have a comparable or pronounced effect in mammals.[6] Other chemical, hormonal or local tissue changes may be involved.[7] The failure to find very

2. Burrows, H.: Biological Actions of Sex Hormones, London, Cambridge University Press, 1945, p. 240.

3. Gardner, W. U., and Pfeiffer, C. A.: Proc. Soc. Exper. Biol. & Med. **37**:678, 1938.

4. Riddle, O.; Rauch, V. M., and Smith, G. C.: Endocrinology **36**:41, 1945.

5. McDonald, M. R.; Riddle, O., and Smith, G. C.: Endocrinology **37**:23, 1945.

6. Riddle, O., and Dotti, L. B.: Proc. Am. Philos. Soc. **89**:499, 1945.

7. Hamblen, E. C.: Endocrinology of Women, Springfield, Ill., Charles C Thomas, Publisher, 1945.

low serum calcium levels in human patients with otosclerosis does not therefore necessarily exclude the presence of an estrogen effect on the bone.

Some, but not all, of the effects of estrogens are restrained by androgens.[6] The age factor often appears to play a part in endosteal bone formation in the degree of response to estrogens.[8] Estrogens cause a more pronounced hypercalcemia and hyperossification in older than in immature pigeons, mice and rats, but the reverse was true for male fowl. Species plays an even greater part in this response.[8]

Estrogens and androgens are excreted in milk and thus may affect the infant. In both boys and girls estrogens exist in small amounts in infancy and early childhood, rise at puberty, are high in active sex life and are low in old age. The usual precosity of skeletal development in the female is believed to be due to the larger estrogen content in the female, which thereby establishes centers of bone growth earlier in the female than in the male. Moreover, calcium metabolism is more intimately dependent on estrogens than on androgens. The matrix of the bone is favored for the deposition of calcium.

It is interesting to note that normally in women estrogens (1) increase incident to follicular maturation and immediately before the onset of the menstrual bleeding; (2) increase with the organization of the corpus luteum and mount still higher prior to ovulation; (3) diminish temporarily at ovulation; (4) remain low during the menstrual flow (pituitary function shows no significant changes during menstrual cycles); (5) increase at the beginning of and during pregnancy; (6) fall abruptly coincident with delivery and onset of lactation and the sudden change from a positive to a negative calcium balance which then ensues; (7) unless there is an idiosyncracy, even large variations in the sex hormone tides appear to cause no pathologic change in the bones. However, repeated large variations may not be devoid of pathologic consequences in susceptible persons.

The growth of the skeleton requires a large calcium supply. Pregnancy and lactation are periods requiring additional calcium (mineral) supply because both the fetus and the nursling are calcium (mineral) robbers. The chief storehouse of calcium is the bones (all the bones), and unless intake and utilization are sufficient the bones are depleted of minerals. When depletion is sufficient bone dyscrasias develop.[7] Otosclerosis is a bone dyscrasia characterized by marked resorptions and depositions of bone in the lesion.

Growth, pregnancy, lactation and the menopause (natural or artificial) are periods of changing activity in the sex glands, often

8. Silberberg, M., and Silberberg, R.: Am. J. Anat. **69**:295, 1941.

accompanied with disorders and diseases of bone coincident with known changes in estrogen levels, and, since the menstrual cycles likewise involve coincidental changes in estrogen levels, it is suggested that variations in estrogens may be one of the reasons for the distinctly higher incidence of otosclerosis in women than in men (the ratio is about 2 to 1), and for the decidedly high incidence of activity and variations in the lesions during the years of greatest activity of the sex glands. It is well known that the deafness of otosclerosis frequently increases during any of the longer periods mentioned and often after emotional upsets related to them. In this connection, one should keep in mind that emotional upsets may, and frequently do, accompany and follow, as well as cause, major endocrine variations.

The ebb and flow of the sexual tides are always associated with changes in the sex hormone values; the estrogens (and androgens) in periods of sex activity are definitely increased, and vice versa, and coincidental emotional reactions are unavoidable, at least in human beings. Careful clinical histories have contributed something to knowledge on these points.

The following facts are pertinent to the present discussion.

Until deafness supervenes it is impossible to make a clinical diagnosis of otosclerosis and, therefore, to determine whether the lesion is active or inactive. But after deafness supervenes and a diagnosis is made, activity and inactivity may be determined, at least in the lesions directly influencing the mobility of the stapes, because activity here lowers the hearing indirectly with frequency, and inactivity here prevents an increase in the deafness due to immobilization of the stapes at any frequency.

The most intensive laboratory examinations should be focused on the periods of activity of the lesion.

The increased deafness sometimes complained of during normal menstrual episodes is not necessarily dependent on increased activity of the lesion, because in every instance carefully observed by me the hearing returned to its former level after the period was over.

Ankylosis of the stapes has been observed macroscopically in several animals but otosclerosis has not been discovered in any animals without true menstrual cycles, and none thus far has been detected in the monkey. Certain female monkeys and women are the only species of animals with true menstrual cycles. Comparatively few temporal bones of monkeys have been examined for otosclerosis.

Because deafness from otosclerosis sometimes begins and frequently progresses at or soon after the menopause, it has been inferred that otosclerosis frequently begins after the menopause. In my experience I have never observed otosclerotic deafness (stationary or increasing)

immediately following the menopause unless it had been present before the menopause. This observation fits in with the facts that the incidence of otosclerosis, the activity in the lesions and the proportion of small lesions all decline after the menopause. Otosclerosis, being a slow growth if initiated after the menopause, would therefore seldom if ever be able to cause deafness for a considerable time subsequent to it. Guild's data [9] certainly tend to support this view. At autopsy, as revealed by his studies, the incidence of otosclerosis varied widely in different decades of life. In spite of an increase in the proportion of the large lesions with age and the high ratio of activity in large lesions, the incidence of activity of otosclerosis as shown at autopsy noticeably diminshed after 50 years of age. These observations coincide with clinical experience—i. e., that after the menopause otosclerotic deafness frequently tends to stabilize.

It has been thought that emotional instability in deafness is due primarily to the deafness. I cannot wholly subscribe to this belief. Any handicap may accentuate instability, but it is noticeable that deafness from chronic suppurative otitis of equal degree and pattern to that from otosclerosis is seldom preceded by instability, whereas deafness from otosclerosis frequently is; and periods of increasing deafness from otosclerosis are very frequently preceded as well as accompanied by emotional episodes. I have in mind, particularly, bilateral deafness, because monaural deafness causes less inconvenience and less nervous or psychic strain than binaural deafness. However, in monaural deafness from otosclerosis emotional instability has been frequently noticeable. I think it may be said that, compared with patients with similar losses from other forms of impedance deafness, otosclerosis-deafened patients are generally the more unstable nervously.

At this point in the argument, attention should be called to a very interesting observation by Sherman and Pearson [10] and Sherman and Regan.[11] In rats, more rapid growth and early sexual maturity are often not advantageous when induced by increases in protein intake alone. If there is not increased calcium intake, there is likelihood of a nervous condition suggestive of a relative calcium deficiency. In other words, the stimulation of growth and early puberty is at some cost to good balance and stability of the nervous system unless calcium diet was also increased.[12] Now, although results of serum calcium determinations do not necessarily coincide with the tissue content or with the availability of calcium for the bones and other tissues of the body, if calcium is on the low side for a considerable time dietary deficiencies and

9. Guild, S. R.: Ann. Otol., Rhin. & Laryng. **53**:246, 1944.
10. Sherman, H. C., and Pearson, C. S.: Proc. Nat. Acad. Sc. **33**:264, 1947.
11. Sherman, H. C., and Regan, M. S.: Proc. Nat. Acad. Sc. **33**:267, 1947.
12. I have observed that early puberty is common in otosclerosis.

emotional instability may be suspected. In persons with otosclerosis, I have shown that although both the calcium and phosphorus are usually within the normal limits, they definitely tend to favor the low side.[13] Low calcium may be one cause for the psychic or nervous imbalance often observed with progressing deafness from otosclerosis, as well as a result of, or a cause of, some of the factors involved in its causation.

One property of estrogens is an ability to dilate the capillaries and induce local hyperemia both in human beings and in lower animals. This effect on the arteriole-capillary bed obtains in varying degrees all over the body but is marked in the vessels of the uterine mucosa.[14] It should be noted that emotional episodes, whether or not caused or followed by variations in estrogens, often noticeably affect the capillary beds; since the capillaries contain no nerves, this effect is probably indirect. Both estrogens and emotional stress often may liberate an excess of acetylcholine and dilate the arterioles and capillaries in large or in very limited areas. This association of the emotional, sex hormone and blood calcium effects fits in nicely with the present thesis.

One more observation. In the light of what has been herein set forth, it should cause no surprise that Negroes are noticeably less susceptible to otosclerosis than are white persons. 1. Metabolism in the Negro is normally more stable and therefore less disturbed by the sex hormone tides than is the white person. His sympathetic nervous system is more stable.[15] 2. The skull of the Negro is thicker and more resistant to bone disorders than is that of the white person. It is the most stable structure in the race. 3. In Africa, Negro natives do not have rickets. Many other bone dyscrasias occur less frequently in the Negroes than in the white person. His teeth show fewer caries. 4. The Negro generally has a more stabile autonomic nervous system than does the white person. He suffers less from pyloric spasm, and he is less sensitive than the white person to cocaine, ephedrine and probably several of the hormones.

Negro mothers more regularly nurse their babies than do white mothers.[15] This normally benefits both mother and child in many ways.

In 1949 I hope to be able to report on some animal experiments and on further observations along the paths herein pointed out. For my studies I shall deeply appreciate receiving the heads or temporal bones of any monkeys subjected to estrogen experimentation for any purpose whatsoever.

---

13. Fowler, E. P.: Calcium and Phosphorus, and Phosphatase Activity, in Otosclerosis, Arch. Otolaryng. **47**:491 (April) 1948.

14. Reynolds, S. R. M., and Foster, F. I.: J. Clin. Investigation **18**:649, 1939.

15. Lewis, J. H.: The Biology of the Negro, Chicago, University of Chicago Press, 1942.

SUMMARY AND CONCLUSIONS

Attention has been called to experimental, histologic and clinical observations, especially to the effects of estrogens on pathologic processes in bone, in an attempt to relate them to otosclerosis, and in connection therewith reference is made to blood calcium–phosphorus and neuropsychologic variations often observed in otosclerosis.

The conclusion is not that any one factor alone, or all the factors combined, are necessarily the cause of otosclerosis, but the thesis is advanced that estrogen is so closely associated with calcium and bone metabolism that it is permissible to assign to it a part in the causation of otosclerosis, at least in persons with receptive hereditary backgrounds, and perhaps it plays a major part in the changing activity of otosclerotic lesions.

140 East 54th Street.

ORIGIN OF THE CALORIC REACTION OF THE LABYRINTH

L. B. W. JONGKEES, M.D.
UTRECHT, NETHERLANDS

SINCE 1906, when Bárány [1] wrote his paper on the caloric reaction of the labyrinth, which made this test one of the most generally employed methods of examining the labyrinth, many theories have been proposed concerning the cause and origin of the vestibular reactions elicited by irrigation with water of a temperature different from that of the body. If these theories are mentioned here, this is done for the present without any comment as to their respective importance.

Bárány [1] was the first to offer a theory to explain the phenomena of the caloric reaction. In his opinion, the change in temperature at the drum membrane caused by the syringing is conducted toward the semicircular canals by the structures in the temporal bone. The first canal reached is the horizontal one in its most lateral part. When a change of temperature occurs here, the endolymph in this special spot is likewise influenced; its specific gravity is lowered by heating and raised by cooling. Thus a flow of endolymph is produced, which is dependent on the position of the canal. This movement of endolymph is the cause of every vestibular reaction resulting from caloric stimulation. In this way, the stimulus for the vestibular nerve is specific.

Bartels [2] expressed the opinion in 1911 that the cause of the caloric reaction is a direct effect on the nerves. Heat has a stimulating and cold a depressing effect. The tone of the labyrinth is decreased by cold and increased by heat.

According to Kobrak [3] (1918), the caloric response is caused by vascular reactions. The vessels in the periphery of the labyrinth are constricted by a cold stimulus, and the central vessels consequently react with dilation. By these changes in the vessels a flow of endo-

---

From the Ear, Nose and Throat Department, University of Utrecht; Director, Prof. Dr. A. A. J. van Egmond.

1. Bárány, R.: Untersuchungen über den vom Vestibulärapparat des Ohres reflektorisch ausgelösten rhythmischen Nystagmus und seine Begleiterscheinungen, Monatsschr. f. Ohrenh. **40**:193, 1906.

2. Bartels, in discussion on Bárány and Wittmaack: Funktionelle Prüfung des vestibular Apparates, Ber. d. deutsch. otol. Gesellsch. **20**:214, 1911.

3. Kobrak, F.: Beiträge zum experimentellen Nystagmus, Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **10**:214, 1918.

lymph is caused, producing, according to Kobrak, a deviation of the cupula, which, in turn, is the cause of the caloric reaction.

Borries [4] stressed the importance of the other structures of the labyrinth. Experiments in which the semicircular canals were damaged or extirpated showed that even then a normal caloric reaction could be caused. In his opinion, the caloric reaction was a reaction of the whole labyrinth, especially of the otoliths.

Brunner [5] disagreed with the statement that a peripheral labyrinthine reaction (deviation of the cupula) is the origin of the caloric test; in his opinion the caloric nystagmus must be of central origin.

Though van Caneghem [6] did not suggest the last possibility as the cause of the caloric reaction, it possibly explains caloric stimulation on the labyrinth. A hot caloric stimulus might cause an increase of the intralabyrinthine pressure; a cold stimulus might cause a decrease. In van Caneghem's opinion, the increase of the intralabyrinthine pressure has its origin in the utricle.

This short review of the various theories on the caloric reaction shows the many possible points of view. One theory, however, is preferred at present, since it gives credit to almost every special point in the caloric test. This is the theory of Bárány. It explains clearly the nystagmus, the sensation of turning around, the deviation in walking or in pointing and so on. Moreover, it gives a very good explanation of the reversal of the nystagmus when the position of the body is reversed (head down), for in this case the stream of endolymph will move in the opposite direction in the horizontal canal. The first objection to the theory, that the quantity of heat should not be large enough to produce a change of temperature in the labyrinth, was proved unfounded by the experiments of Magnus, de Kleijn [7] (1918) and Socin [8] (1915). In these experiments the authors showed

4. (*a*) Borries, G. V. T.: Studier over vestibulær Nystagmus, Thesis, Copenhagen, 1920; (*b*) Studies on Normal Caloric Nystagmus, Acta oto-laryng. **4**:8, 1922-1923; (*c*) Theorie des kalorischen Nystagmus, Arch. f. Ohren-, Nasen- u. Kehlkopf. **113**:117, 1925.

5. Brunner, H., in Alexander, G., and Marburg, O.: Handbuch der Neurologie des Ohres, Berlin, Urban & Schwarzenberg, 1921, vol. I, p. 239.

6. van Caneghem, D.: Application du Romberg amplifié et de la réaction vestibulaire sonore au diagnostique différentiel entre la tympanosklérose et l'otospongiose, Bull. Soc. belge d'otol., rhin., laryng., 1946, p. 88.

7. de Kleijn, A., and Magnus, R.: Sympathicuslähmung durch Abkühlung des Mittelohres beim Ausspritzen des Gehörganges der Katze mit kaltem Wasser, Arch. f. Ophth. **96**:368, 1918.

8. de Kleijn, A.; Socin, C., and de Burlet, H. M.: Zur näheren Kenntnis des Verlaufs der postganglionären Sympathicusbahnen für Pupillenerweiterung, Lidspaltenöffnung und Nickhautretraktion bei der Katze, Arch. f. d. ges. Physiol. **160**:407, 1915.

that even small quantities of cold water syringed into the external auditory canal of a cat cause a change of the size of the pupil by paralyzing the postganglionic fibers concerned with widening of the pupil, which have their course on the lateral wall of the labyrinth. The change in temperature in this way is proved to reach the lateral wall of the labyrinth. Maier and Lion [9] (1921) and later Steinhausen [10] (1931) were able to demonstrate visibly the movements of the cupula in caloric stimulation even when the temperature of the stimulus differed from that of the body by only half a degree. These facts combined with the investigations of Meurman [11] (1924) and Dohlman [12] (1925), who studied the conduction of heat in the petrous bone, and the beautiful calculations of Schmalz [13] (1931), which agree so closely with the proved facts, make the theory of Bárány very attractive. The time of latency and the duration of the nystagmus are of the same duration as the flow of heat through the labyrinth. None of the other theories can stand up against the clinical and experimental facts in the same way as can Bárány's hypothesis.

The theory of Kobrak does not give a reasonable explanation of the reversal of the nystagmus in a reversed position, nor does any of the other theories, though Borries asserts that the otoliths are the cause of the phenomenon. According to Grahe [14] (1921-1923), influences originating in the central nervous system are the cause of the decrease of the effect of the caloric test when strong stimuli are given. This is one of Kobrak's arguments for his theory. Grahe [14a] also syringed an ear of a patient with a perforated drum with a solution of epinephrine at the temperature of the body; he could not produce any

9. Maier, M., and Lion, H.: Experimenteller Nachweis der Endolymphbewegung im Bogengangsapparat des Ohrlabyrinthes bei adäquater und kalorischer Reizung, Arch. f. d. ges. Physiol. **187**:47, 1921.

10. Steinhausen, W.: Ueber die Beobachtung der Cupula in den Bogengangsampullen des Labyrinthes bei der thermischen und adäquaten rotatorischen Reizung, Arch. f. d. ges. Physiol. **232**:500, 1933; Ueber den experimentellen Nachweis der Ablenkung der Cupula terminalis in den intakten Bogengangsampullen des Labyrinthes bei der thermischen und adäquaten rotatorischen Reizung, Ztschr. f. Hals-, Nasen- u. Ohrenh. **29**:211, 1931.

11. Meurman, Y.: Experimental Investigations on Conduction of Warmth in the Labyrinth of the Ear and on the Caloric Nystagmus, Acta oto-laryng. **6**:556, 1924.

12. Dohlman, G.: Physikalische und physiologische Studien zur Theorie des kalorischen Nystagmus, Acta oto-laryng., 1925, supp. 5, p. 1.

13. Schmalz, G.: The Physical Phenomena Occurring in the Semi-Circular Canals During Rotatory and Thermic Stimulation, Proc. Roy. Soc. Med. **25**:1, 1931.

14. (*a*) Grahe, K.: Weitere Mitteilungen über die Auslösung des Nystagmus durch 5- ccm- Spülung, Beitr. z. Anat., Physiol., Path., u. Therap. d. Ohres **17**:251, 1921; (*b*) Zur Wirkungsweise des kalorischen Schwachreizes, ibid. **19**:101, 1923.

vestibular reaction in this way. Thus the theory of Kobrak [3] becomes very improbable.

The fact that strong stimuli have an effect on the following caloric test during some twenty minutes caused Woletz [15] (1932) to consider the existence of a central effect. One argument is used against the theory of Bárány: It is possible to perform the caloric test with normal results if the semicircular canals are damaged or even extirpated (Fujimori [16] 1924, Borries [4c] 1925, Passe [17]). After some weeks the caloric reaction in pigeons was normal again, even when all three canals were extirpated (Borries [4c]). In patients with Ménière's disease a normal caloric reaction is found after electrocoagulation of the horizontal canal (Passe). Thornval [18] (1922), however, could not corroborate these results. These experiments, together with the paradoxic reaction of the labyrinth—i. e., the presence of the caloric in the absence of the turning reaction—induced Borries to propose his theory on the otolithic origin of the caloric reactions. De Kleijn and Lund [19] (1924), on the other hand, still were able to elicit the thermal reaction after displacement of the otoliths by centrifugal force by the method of Wittmaack. Their conclusion, that the caloric reaction is therefore independent of the function of the otoliths, is rightly disputed by Borries,[4c] who stated that this conclusion was wrong because the maculas and nerves were still present. If the caloric stimulus acts on the otoliths, it is unlikely to happen through the intervention of the otoliths themselves. Mygind [20] (1925), who tried to find a summarizing theory, stressed the point that in cases of paradoxic nystagmus the reversal of the nystagmus in the reversed position is generally absent. He compared this to a positional nystagmus and accepted an influence of the otoliths as an extension of the theory of Bárány.

The direction of the caloric nystagmus is horizontal with a rotatory component, especially if minimal stimulation is not used, in which case the direction is more purely horizontal (Veits [21] 1928). The position

15. Woletz, F.: Studie zum vestibulären Erregungsablauf mittels des kalorischen Nystagmus, Ztschr. f. Hals-, Nasen- u. Ohrenh. **30**:524, 1932.

16. Fujimori, S.: Ein neuer Prüfungsversuch über das Zustandekommen der kalorischen Reaktion des Labyrinthes, Klin. Wchnschr. **3**:885, 1924.

17. Passe, E. G.: Personal communication to the author.

18. Thornval: Recherches experimentales sur les pigeons, Acta oto-laryng. **5**:263, 1923.

19. de Kleijn, A., and Lund, R.: Ueber vestibuläre Augenreflexe: Ueber die Genese des Kaltwassernystagmus bei Meerschweinchen, Acta oto-laryng. **6**:92, 1924.

20. Mygind, S. H.: Wie entsteht der kalorische Nystagmus? Ztschr. f. Hals-, Nasen- u. Ohrenh. **11**:68, 1925.

21. Veits, C.: Zur Technik der kalorischen Schwachreizuntersuchung, Ztschr. f. Hals-, Nasen- u. Ohrenh. **19**:542, 1928.

of the head of the tested person influences the direction of the nystagmus. Quix [22] (1929) pointed out that the rotatory component of the caloric nystagmus is caused by the vertical canals, as the nystagmus in the direction of the canals is increased by looking in the direction of the quick phase of that component. According to Quix,[23] a flow of endolymph in a canal causes a nystagmus in the same plane and with a direction of the slow phase similar to the direction of the stream of endolymph. The total apparent nystagmus is composed of the activity of the three canals.

In only two circumstances did de Kleijn and Storm van Leeuwen [24] (1922) obtain total abolition of the caloric reaction: when the test animal was placed in such a position that (1) the horizontal canal was exactly horizontal on a binaural axis, and (2) that also the vertical canals were placed in such a position that the thermal stimulus could produce no effect; in all other circumstances a vertical nystagmus was elicited in the indifferent zone. They concluded that the vertical canals must play a role in the caloric reactions. The mechanism of the stimulation of these canals is supposed to be the same as that of the horizontal canal in the light of Bárány's [1] hypothesis.

An extravestibular influence on the caloric nystagmus is undeniable, though the results of the many experiments on this matter do not give a unanimous answer. Extirpation of the cervical sympathic nerve or its ganglions has no effect on the caloric reaction, according to Fujimori [25] (1924). On the other hand, experiments of Terracol [26] (1927) demonstrated that manipulation of the sympathic ganglions in the neck could produce a nystagmus in itself. Montandon [27] (1945) and Crabbe [28] (1946) have given an extensive summary of the reciprocal action of the labyrinth and the sympathic and parasympathic nervous

22. Quix, F. H.: L'analyse du nystagmus rotatoire, Bull. Soc. belge. d'otol., rhin., laryng., 1929, p. 21.

23. Quix, F. H.: Ligging van het Booggangstelsel, Nederl. keel-, neus,- en oorheelk. vereenig. **46**:7, 1928.

24. de Kleijn, A., and Storm van Leeuwen, W.: Ueber vestibuläre Augenreflexe: III. Ueber die Genese des Kaltwassernystagmus bei Kaninchen, Arch. f. Ophth. **107**:109, 1921.

25. Fujimori, S.: Untersuchungen über den Einfluss des Sympaticus auf den Muskeltonus an den tonischen Augenreflexen des Kaninchens. Klin. Wchnschr. **3**:885, 1924.

26. Terracol, J.: Nystagmus et sympathique cervical, Rev. d'oto-neuro-ocul. **5**:963, 1927.

27. Montandon, A.: Le labyrinthe et le système nerveus végetatif, Pract. oto-rhino-laryng. **7**:285, 1945.

28. Crabbe, F.: Etude critique des techniques d'examen labyrinthique, J. belge de neurol. et de psychiat. **44-46**:541, 611 and 691, 1946.

system. De Kleijn and Versteegh [29] (1924) demonstrated the influence of irritation of the nasal mucosa on the caloric nystagmus, which was corroborated by the experiments of Thielemann [30] (1924), who could also stop the caloric reaction by cocainization of the mucosa of the middle ear. Hennebert [31] (1946) noted the influence of brushing of the temple and similar manipulations, which cause a diminution of the nystagmus and a disappearance of the sensation. I was able to corroborate this fact, especially for sensation. The quick phase of the nystagmus may disappear, but the slow phase always remains visible as a deviation. Those manipulations do not influence the duration of the caloric response. Kobrak [3] described the influence of pressure on the region of the tragus as producing a sensitization of the caloric reaction, an observation which, according to Bárány [32] (1928), is "surely inexact."

It ought to be possible to elicit a caloric nystagmus even if the labyrinth does not function any longer. Urbantschitsch [33] (1917) was the first to describe such a case. The demand of de Kleijn that hot and cold stimulation be used before the intactness of the function of a labyrinth may be asserted suggests that this fact is generally accepted nowadays.

In the clinic with which I am associated, similar cases are frequently encountered, responding to both cold and hot stimulation in the same way after loss of function of a labyrinth. Consequently, it should be possible to elicit caloric nystagmus from the external auditory canal by reflex directly or via a vascular reaction.

There are still other experiments which may be useful in providing an insight into the action of caloric stimulation—the simultaneous irrigation of the two ears with equal quantities of water of the same temperature. As has been shown by Ruttin [34] (1909), Quix,[35] de

29. de Kleijn, A., and Versteegh, C.: Some Experimental Remarks on Ménière's Disease, Acta oto-laryng. **6**:38, 1924.

30. Thielemann, M. B.: Die experimentelle Ausschaltung der Bárányschen Abweichreaktion, Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **20**:213, 1923-1924.

31. Hennebert, P.: Inhibition périphérique des réactions vestibulaires, Bull. Soc. belge d'otol., rhin., laryng., 1946, p. 86.

32. Bárány, R., in discussion on Charousek: Das Drucksymptom des normalen Ohres, Ztschr. f. Hals-, Nasen- u. Ohrenh. **20**:364, 1928.

33. Urbantschitsch, E.: Nystagmus gegen die gleichnamige Seite, Monatsschr. f. Ohrenh. **51**:56, 1917.

34. Ruttin, E.: Zur Differenzialdiagnose der Erkrankungen des vestibularen Endapparates, der Vestibularnerven und seiner zentralen Bahnen, Verhandl. d. deutsch. otol. Gesellsch., 1909, p. 169.

35. Quix, F. H.: Verschijnselen bij het uitspuiten van beide oren tegelijk, Nederl. keel-, neus-, en oorheelk. vereenig. **30**:26, 1919.

Kleijn and Versteegh [36] (1927) and Fischer [37] (1926), bilateral irrigation generally does not cause a nystagmus of the second degree. However, if the eyes are directed toward the flow of endolymph in the vertical canals a nystagmus becomes apparent. It is evident that the horizontal nystagmus of the two horizontal canals abolish each other either peripherally (Quix [35]), or centrally (de Kleijn [38]). Experiments in rabbits seem to prove the latter view. That a nystagmus elicited by the action of the otoliths should give similar results is very improbable, as the effect on the two semicircular canals is exactly reversed for the horizontal canals. The vertical canals are not influenced in an exactly reverse way, and the result is a vertical nystagmus of the first degree. If the theory of Borries were true, the stimulations of the otoliths, which are synergists, should reinforce each other, even if one should accept the view that a nystagmus might originate from the otolith apparatus, an assumption that has never been proved.

CONSIDERATIONS

To make a choice from the many contradictory experiments and views it seems reasonable to divide these considerations in two parts:

1. Which phenomena may be explained by the theory of Bárány?

2. Which phenomena cannot be explained as yet by the theory of Bárány?

1. Which phenomena may be explained by the theory of Bárány?

The phenomena which strongly and evidently support Bárány's theory are the following: (*a*) the direction of all vestibular reactions resulting from the syringing with water of a certain temperature; (*b*) the influence of variations of the position of the body on the direction of the nystagmus; (*c*) the fact that long and strong stimulation may inhibit (Kobrak,[3] Grahe [14a]) the caloric reaction; (*d*) the occasionally observed inversion of the nystagmus at the end of a caloric test; (*e*) the propulsion and retropulsion caused by bilateral irrigation (Fischer and Veits [39] 1927). Here the effects of the two horizontal canals abolish each other but the effects of the vertical canals cooperate to produce either a propulsion or retropulsion according to the position of the head and the nature of the stimulus (hot or cold); (*f*) the conformity

36. Versteegh, C., and de Kleijn, A.: Some Remarks upon the Present Position of the Physiology of the Labyrinth, J. Laryng. & Otol. **42**:649, 1927.

37. Fischer, M. H.: Beiträge zur Physiologie des menschlichen Vestibularapparates, Arch. f. d. ges. Physiol. **213**:74, 1926.

38. de Kleijn, A., in discussion on Quix.[35]

39. Fischer, M. H., and Veits, C.: Beiträge zur Physiologie des menschlichen Vestibularapparates: Bilateralmethoden, speziell Doppelspülungen; B. Die Pulsionreflexe, Arch. f. d. ges. Physiol. **217**:357, 1927.

between the measured and calculated flux of heat and the caloric reaction.

Points *c* and *d* need some explanation. A strong stimulus is often less effective than a weaker one, especially if the temperature of the water used for the test differs considerably from the temperature of the body. According to Grahe,[14a] this is of central origin. Groen and I [40] (1946) have warned against the acceptance of a central origin of phenomena for which a peripheral origin has not been proved impossible. I consider this another example of such a phenomenon, which not only is of peripheral origin but also strongly supports Bárány's point of view.

When the thermal stimulus is applied, a positive or negative flow of heat pervades the petrous bone. The pathway of this flow of heat has been described by Schmalz.[13] When it reaches the lateral part of the horizontal canal this will be cooled down, while the other part of the labyrinth retains the same temperature (if a cold stimulus is applied). A difference of temperature between various parts of the labyrinth is caused in this way, producing a variation in the density of the fluid in the horizontal canal at different places and a stream of the endolymph. Now if the stimulus acts for a longer time or is much stronger (colder water), the cooling of the canal is not limited to its most lateral part but reaches the other parts of the labyrinth as well. In this way, the loss of temperature at one point of the wall of the canal may be larger but the difference in temperature between two different points of the wall of that canal is less than in the first instance. That the flow of heat in an ample and strong irrigation reaches deeper is shown by the fact that minimal irrigation causes a pure horizontal nystagmus and strong irrigation a nystagmus with a rotatory component. It seems that in the second instance the vertical canals are reached. These views are depicted graphically in the accompanying chart. In this chart the effect of a minimal caloric stimulus is compared to the effect of a strong irrigation. The ample and strong irrigation reaches deeper, but the difference in temperature between two different parts of the labyrinth is smaller. However the effect on the vertical canals is greater (rotatory nystagmus). The stippled areas indicate the spread of the heat.

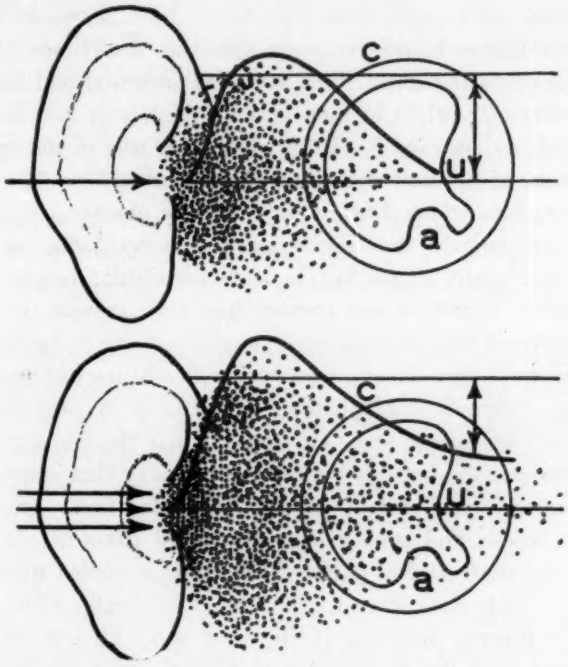
Experimental observations on a patient submitted to syringing with water at 18 C. for thirty minutes may illustrate these theoretic considerations.

A normal man of 35 years, without any complaints referable to the ears and with normal structure and function of both labyrinths was submitted to the caloric test with water at a temperature of 12 C. flowing freely while he lay horizontal

40. Jongkees, L. B. W., and Groen, J. J.: The Nature of the Vestibular Stimulus, J. Laryng. & Otol. **61**:529, 1946.

on his back, his head flexed at 30 degrees. During the experiment 6 liters of water flowed from a tank through the external auditory canal. The left ear was syringed; the irrigation began at 9:58 a. m. After fifteen seconds a deviation of the eyes to the left is noted. After twenty seconds the first quick phase was seen; it was accompanied with a rotatory sensation to the right.

At 10:1 a. m. sensation decreased, and the nystagmus was very clear, at a frequency of 78 per minute. The sensation decreased still more when the subject closed his eyes. At 10:3 a. m. only a slight sensation of lying more or less on the nonirrigated side was perceived (Grahe [41] 1927). The nystagmus was much less than before. If the subject looked to the left, nystagmus was no longer observed. At 10:5 there was no sensation of turning, but the patient was



Diagrammatic representation of the flow of heat with weak and with strong stimulation of the drum membrane. *c*, Horizontal semicircular canal; *u*, utricle; *a*, ampulla; single horizontal arrow, weak stimulation; triple horizontal arrows, strong stimulation.

nauseated. The nystagmus was very slight. At 10:10 the nystagmus was very rapid (frequency 130 per second) and slight; there was no sensation of turning but the patient was intensely nauseated. At 10:25 there was no turning sensation, but there was strong nausea. Nystagmus of the second degree was not present, but it could still be caused by looking to the right (first degree). At 10:28 the syringing was stopped. A slight nystagmus to the right began again. During

41. Grahe, K.: Die Vertikalempfindung auf dem "Vestibular" Tische bei kalorischer Reizung des normalen und labyrinthlosen Ohres und des Halses, ein Beitrag zur Frage der "Vestibularreactionen" bei fehlendem Labyrinth, Acta oto-laryng. **11**:158, 1927.

two and one-half minutes no changes took place. At that moment a sensation of turning and a nystagmus of the second degree, both toward the left, appeared. These lasted till 10:34; then the sensation of turning to the left stopped. A slight and frequent nystagmus to the left was noted for another minute. The nausea was still increasing, but the patient did not vomit. At 10:40, in the walking test, a strong deviation was still present. By 10:45 there were no abnormalities except the nausea, which lasted till about noon.

In some other subjects, used for different purposes (Voogd [42] 1946), the same course of events was noted when their ears were irrigated with ice water for about twenty minutes. In these experiments it was proved that the caloric stimulus even influenced the function of the cochlea, causing an experimental diplacusis. In a series of 60 normal subjects a nystagmus to the irrigated side was sometimes observed at the end of the cold caloric test. The same phenomenon had already been noted by Kobrak [3] (1918) in men and by de Kleijn and Versteegh [29] (1924) in rabbits. Bárány [32] (1928), however, was of the opinion that the observation of Kobrak was "surely inaccurate."

At the congress where Bárány rejected the observation of Kobrak, he received the answer that the nystagmus toward the ear syringed with cold water really exists but is of nonvestibular origin.

Nevertheless, I believe not merely that this answer is wrong but that the existence of this homolateral nystagmus is one of the proofs of the truth of Bárány's own theory and surely needs no explanation on a central basis. Schmalz [13] calculated the pathway of heat through the labyrinth after the caloric test. He showed that the cooling progresses as a wave through the petrous bone in such a way that some time after the test the most lateral part of the canal is cooled first. Thereafter the cold wave proceeds and cools the more medial parts of the labyrinth, until finally the most medial point of the canal is cooled more than the lateral part. This may start a flow of endolymph, which naturally moves in the reverse direction to the first one. This is an absolutely clear explanation of the reversal of the caloric nystagmus at the end of the test and of its peripheral origin.

Consequently, it is seen that the inhibition of the caloric reaction by strong stimuli and the reversal of the nystagmus, sometimes observed at the end of a strong caloric test, are phenomena which support the view of Bárány as to the origin of the caloric reaction.

2. Which phenomena cannot be explained as yet by the theory of Bárány?

It is easier to collect facts which fit a hypothesis than it is to enumerate mere incidental facts which do not fit a theory. This is the most important reason that the following enumeration will be longer

42. Voogd, J.: Experimenteele diplacusie, Nederl. keel-, neus-, en oorheelk. veereenig. **79**:3, 1946.

than the previous one, and it does not make Bárány's theory less valuable in the least.

These facts cannot be explained by Bárány's theory:

1. The fact that sometimes the caloric reaction may still be elicited after the semicircular canals or even the entire labyrinth have been destroyed.

2. The predominance of the cold over the hot caloric nystagmus. Ewald's law would suggest a different result.

3. The predominance of the nystagmus in the normal position over the thermal reaction in the reversed position.

4. The fact that the reversal of the nystagmus does not take place in two planes which are separated by 180 degrees.

5. Directional preponderance.

6. Sensation of turning is usually accompanied with a sensation of changed position (*Körperneigungsreflex*), which often predominates.

7. In the caloric test the nystagmus has a lower threshold than the sensation, in contrast to the normal rotatory stimulation of the labyrinth, which causes the sensation more readily than the nystagmus (Hulk and Jongkees [43] 1948).

8. The result of a personal investigation into the reversal of the nystagmus by changing the position of the subject on a binaural axis is that not only may this reversal take place at a different point for the left than for the right ear (a fact easily explained by a dissimilar inclination of the left and the right horizontal canal) but also that the point of reversal is not always the same for irrigation with cold and with hot water.

In the same series of experiments I was able to corroborate the observations of Behrman [44] that cold heterolateral nystagmus is caused at an extension of about 200 degrees and the cold homolateral reaction at an extension of 140 degrees (in the reverse position).

9. The paradoxic caloric reactions (caloric test positive, rotatory test negative).

There are several possibilities to explain these disharmonies: vascular influences, influences from the auditory canal, from the otoliths and from the central nervous system.

In a previous paper I presented some of the reasons that vascular influences may be accepted even in the normal thermal reactions:

---

43. Hulk, J., and Jongkees, L. B. W.: The Turning Test with Small Regulable Stimuli: The Normal Cupulogram, J. Laryng. & Otol. **62**:70, 1948.

44. Behrman, W.: Ueber Indifferenzlagen und Nystagmusgebiete, Acta oto-laryng., 1940, supp. 40, p. 1; Ueber Indifferenzlagen und Nystagmusgebiete, ibid. **30**:298, 1942.

(*a*) the binominal spread of the hot caloric reaction (duration of the nystagmus) in opposition to the a-binominal character of that of the cold caloric test, and (*b*) the disappearance of directional preponderance and of the difference of hot and cold reaction after inhaling amyl nitrite.

It is probable that most of the points mentioned may be explained by vascular influences, either on the labyrinth itself or on the pathways via which the reaction is conducted. The latter might be called a central influence, but is entirely unproved. Reflexes from the external auditory canal are not improbable. It is not known how these reflexes act but here as well an intermediary vascular activity is not rejectable.

In reviewing the points mentioned, most of them may be well explained by vascular activity. For one of them another explanation must be found, since vascular influences do not seem to give a reasonable one: The sensation of a changed position (*Körperneigung*) is typical, obtained by stimulation of the otolith organs (Groen and Jongkees [40] 1946). A linear acceleration causes the sensation of change of position; the direction of the acceleration of gravity causes the sensation of our position in space. Thus it is very probable that the sensation of a changed position might be caused by the stimulation of the otolith or of one of them or of their nerves. That the thermal stimulus even reaches the cochlea is proved by the experiments of Voogd,[42] who was able to find a clearly perceptible effect of caloric stimulation on the cochlea. An experimental dysacousis was the result of the thermal tests. If the cochlea is reached by the thermal stimulus surely the otoliths are within reach too, and it does not seem improbable that the change of sensation of position is caused by this stimulation. Stimulation with cold water gives the same sensation as being in a position in which the otoliths of the stimulated side are lower than the other otoliths—in other words, cold water gives the same stimulation as a decrease of the pressure of the stones on their maculas. With hot water the effect is quite the reverse. This is easily understood if one assumes that a cold stimulation causes a decrease of the normal impulse and a hot stimulation an increase. This is not the same as the conception of Borries,[4] who expressed the opinion that the nystagmus caused by caloric stimulation should be elicited or at least seriously influenced by the action of the otoliths. I cannot possibly believe that an argument might be found to accept such a theory because a nystagmus of otolithic origin has never been found. However, one influence is possible. If a subject looks in the direction of the quick phase of the nystagmus it becomes clearer while it decreases on looking in the opposite direction. A well known function of the otoliths is their action on the position of the eyes (contrarotation and compensatory positions of the eyes). It is not impossible that the action of the caloric stimulation on the otoliths

causes a position of the eyeballs which is either advantageous or disadvantageous for the resulting nystagmus (Blumenthal [45] 1924).

However, in some experiments I could not elicit a change in the position of the eye by cold stimulation. These experiments were performed to measure the contrarotation of the eyes on a position chair (Quix) with the aid of a linear after-image (Fischer [46]). Neither in the normal, nor in an oblique position was a change of the position of the after-image caused by the caloric test.

CONCLUSIONS

A survey of the present knowledge of the caloric stimulation of the labyrinth is given. The theories which were reported to solve the problem of the origin of the thermic reactions are described. It appears that the theory of Bárány gives a very satisfactory solution of most of the problems of the caloric test. In some instances it is proved that even when Bárány's theory apparently could not give a solution, a new argument could be found for the value of this theory. However, many facts remain which cannot be explained by the theory of Bárány, and, as was shown previously, more than one natural variable may explain these facts. The reasons are presented for the acceptance of vascular and otolithic influences. In my opinion, the thermal reaction ought to be seen as a reaction of the entire labyrinth, especially of the horizontal canals but likewise of the vertical canals and the otoliths in some instances. A vascular component seems to be present, especially in the cold caloric test.

---

45. Blumenthal, A.: Zur Erklärung des kalorischen Nystagmus, Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **20**:307, 1923-1924.

46. Fischer, M. H.: Messende Untersuchungen über die Gegenrollung der Augen und die Lokalisation der scheinbaren Vertikalen bei seitlicher Neigung (des Kopfes, des Stammes und des Gesamtkörpers), Arch. f. Ophth. **118**:633, 1927; Messende Untersuchungen über die Gegenrollung der Augen und die Lokalisation der scheinbaren Vertikalen bei seitlicher Neigung des Gesamtkörpers bis zur 360°, ibid. **123**:476, 1930; Messende Untersuchungen über die Gegenrollung der Augen und die Lokalisation der scheinbaren Vertikalen bei seitlicher Neigung des Körpers, Kopfes und Stammes, ibid. **123**:509, 1930.

CLINICAL TEST OF A NEW SPRAY

THOMAS F. FURLONG Jr., M.D., M.Sc.(Med.)
Chief of Otolaryngology, The Pennsylvania School for the Deaf
PHILADELPHIA

TREATMENT of the common cold is difficult to evaluate, for obvious reasons. One important obstacle is the fact that it is not often possible to keep a large group of patients under observation in anything approaching a controlled environment. At the Pennsylvania School for the Deaf, in Philadelphia, there are approximately 600 students in residence from October to the middle of June. While these children are divided into upper, middle and lower schools as far as class work goes, they live, eat and play together, and in the dormitories there are approximately 30 students to each room. With these conditions, colds are naturally a major problem; these circumstances also, however, offer a favorable testing ground for treatment of colds.

In the past thirteen years, a variety of nasal sprays too numerous to mention have been used here in an attempt to cut down the spread of infection and the duration of individual colds. The results have varied widely, but no one medication seemed outstandingly successful. In the last couple of years there has been considerable evidence that penicillin used locally is unusually effective in the control of colds. The studies of Knott and Blaikley,[1] Struble,[2] Proetz[3] and Lierle and Evers[4] uphold this view, and just recently Grubb and Puetzer[5] presented laboratory evidence that local penicillin therapy reduces the bacterial count in the nasal cavities. Apparently, whatever the primary

---

Read before the Philadelphia Laryngological Society, Jan. 6, 1948.

From the Pennsylvania School for the Deaf (Mount Airy); service of Dr. Furlong.

1. Knott, F. A., and Blaikley, J. B.: Penicillin Sprays and Upper Respiratory Tract Infection, Brit. M. J. **1**:349-350 (March 9) 1946.

2. Struble, G. C.: Penicillin Therapy in the Practice of Otolaryngology, Arch. Otolaryng. **42**:327-338 (Nov.-Dec.) 1945.

3. Proetz, A. W.: Cilia and Penicillin: A Laboratory Note, Ann. Otol., Rhin. & Laryng. **54**:94-95 (March) 1945.

4. Lierle, D. M., and Evers, L. B.: Effects of Certain Drugs upon Ciliary Activity of Mucous Membrane of Upper Respiratory Tract, Laryngoscope **54**: 176-185 (April) 1944.

5. Grubb, T. C., and Puetzer, B.: A Method for Counting Bacteria in the Nasal Cavity: Application of the Method in Demonstrating the Action of Intranasal Penicillin Medication, J. Bact. **54**:51-52 (July) 1947.

cause of the condition may be, penicillin should help to reduce secondary bacterial infection. It was therefore decided to conduct a clinical study on the local use of penicillin in treatment of the common cold at this school for a period beginning in October 1946 and running into May 1947.

The medicament used was a penicillin-vasoconstrictor combination.[6] The addition of the vasoconstrictor not only adds to the patients' comfort but also, by its shrinking effect on the nasal mucosa, may facilitate the dispersion of penicillin throughout the passage. The p_H of the preparation used is approximately 6.0—i. e., within the slightly acid range of normal nasal secretions. The solution was used as a spray rather than in the form of drops because, since the interior of the nose is triangular bilaterally, it is my observation that a spray is more efficient.

METHODS

Students with colds were referred to the infirmary by their teachers. A nasopharyngoscopic examination was made and each cold diagnosed, when possible, as either infectious or allergenic or a combination of the two. To increase the significance of the results, the severity of each patient's condition was noted by grading it 1, 2, 3 or 4, the figure 4 indicating the severest cold.

A pressure atomizer was used, with a newly sterilized tip attached for each patient. The solution was first sprayed five times "straight" into each nostril, the atomizer being held parallel to the floor; the purpose of this was primarily to shrink the inferior turbinate bodies. After about three minutes, the patient's head was tipped back and the spray was applied again, five times in each nostril, this time with the tip of the atomizer parallel to the bridge of the nose, in order that the solution might reach the middle and superior turbinate bodies.

After the first visit, the students were treated twice daily in the infirmary by registered nurses, and after one week they were referred again to me for reexamination, including use of the nasopharyngoscope.

ANALYSIS OF CASES

Total number of patients	262	
Total number of colds	670	
Number of colds due to infection	299	(44 per cent)
Number of colds due to allergy	173	(26 per cent)
Number of colds due to infection and allergy combined	18	(3 per cent)
Number of unidentified colds	180	(27 per cent)
Average number of colds per patient	2.6	
Total number of treatments	6,825	
Average number of weeks of treatment, per cold	1.5	

RESULTS

In the following tabulations, the 490 cases of colds of identifiable type are broken down by the type and severity of the condition and

6. The product used (par-pen®, supplied by Smith, Kline & French Laboratories, Philadelphia) provides, when freshly mixed, 800 units of penicillin per cubic centimeter in a 1 per cent solution of hydroxyamphetamine hydrobromide (paredrine hydrobromide®).

Total of All Types of Identifiable Colds

Weeks of Treatment	Number of Patients	Percentage of Total Number of Patients
1	287	58
2	147	30
3	33	7
4	17	3
5	4	2
6	2	
Total	490	100

Cases of Infectious Origin

(Arranged according to severity of condition, 1 representing the mildest and 4 the severest condition)

Weeks of Treatment	Degree of Severity 1		2		3		4		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	118	63	52	55	10	66	2	67	182	61
2	55	30	35	37	1	7	..	..	91	30
3	11	6	6	6	1	7	..	..	18	6
4	2	1	2	2	2	13	1	33	7	2
5	..	..	..	..	1	7	..	..	1	1
6	..	..	..	..	..	..	..	..	..	..
Total	186	100	95	100	15	100	3	100	299	100

Cases of Allergenic Origin

(Arranged according to severity of condition, 1 representing the mildest and 4 the severest condition)

Weeks of Treatment	Degree of Severity 1		2		3		4		Total	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
1	77	64	24	59	4	36	..	..	105	61
2	35	29	10	25	4	36	..	..	49	28
3	8	7	4	10	1	9	..	..	13	8
4	..	..	1	2	2	19	1	100	4	2
5	..	..	1	2	..	..	..	..	1	1
6	..	..	1	2	..	..	..	..	1	
Total	120	100	41	100	11	100	1	100	173	100

Cases of Combined Infectious Allergenic Origin

Weeks of Treatment	Number of Patients	Percentage of Patients
1	..	..
2	7	39
3	2	11
4	6	33
5	2	11
6	1	6
Total	18	100

the number of weeks of treatment from time of the first examination until discharge. For this purpose each case was placed in the category of the severest condition observed during the period of continuous treatment.

REACTIONS

Although the penicillin-vasoconstrictor was used for a total of 6,825 treatments, no untoward reactions were noted.

SUMMARY AND CONCLUSIONS

A six months' study in the treatment of the common cold at the Pennsylvania School for the Deaf is reported. Patients with a total of 490 colds, diagnosed as infectious, allergenic or a combination of both types, were treated with a combination of penicillin and a vasoconstrictor substance. Of this number, 58 per cent were cleared up within one week of the first treatment, and 88 per cent were discharged after two weeks' treatment. The preparation used appeared to be equally effective in allergenic and infectious colds. No unfavorable reactions were reported.

Of all the medications tried for treatment of the common cold during my thirteen years as Chief of Otolaryngology at this school, this penicillin-vasoconstrictor combination has proved the most satisfactory.

36 Parking Plaza, Ardmore, Pa.

TUBULAR WAX SPLINTS IN SUBMUCOUS RESECTION

Report of One Hundred and Fifty Cases

MAURICE SCHIFF, M.D.
AND
FRED HARBERT, M.D.
PHILADELPHIA

SINCE the first submucous resection operation was described, there have been many suggestions and different methods for packing the nose or methods for keeping the two flaps in close apposition. Ballenger,[1] in Jackson's textbook on diseases of the nose and throat, describes this method of packing:

> After all the septal abnormalities have been corrected and the flaps co-apted, a one-half inch gauze tape soaked in petroleum jelly is carefully packed into each nostril so as to hold the septal flaps in the midline position. The dressing is removed in twenty-four hours and if bleeding occurs, or the flaps do not stay in position, the dressing may be re-inserted on one or both sides for another twenty-four hours. If crust tends to form over the nasal mucosa, oil or petroleum jelly may be applied to the involved area.

This description of the usual method of packing the nose is quoted to demonstrate the two factors, bleeding and crusting, which are decreased greatly by the technic which we are about to describe. Some workers have advocated simple approximation of the flaps without use of any packing at all in the nose. In our hands, the incidence of hematoma has been too high to warrant routine use of this procedure.

The use of dental wax itself in nasal surgery is not a new idea, having been described by Pratt and Pratt in 1924.[2] The splints which the Pratts described, however, were simply sheets or plates of dental wax as wide and as long as possible which were placed on both sides

---

Read before the Philadelphia Laryngological Society, April 6, 1948.

From the Department of Otolaryngology, United States Naval Hospital.

This article has been released for publication by the Division of Publications of the Bureau of Medicine and Surgery of the United States Navy. The opinions and views set forth in this article are those of the writers and are not to be construed as reflecting the policies of the Navy Department.

1. Ballenger, in Jackson, C., and Jackson, C. L.: Diseases of the Nose, Throat, and Ear, Including Bronchoscopy and Esophagoscopy, Philadelphia, W. B. Saunders Company, 1945, p. 38.

2. Pratt, F. J., and Pratt, J. A.: Intranasal Surgery, Philadelphia, F. A. Davis Company, 1924, p. 104.

of the septum to support the membrane. Hollender [3] also suggested use of wax plates to prevent re-formation of synechias between septum and lateral nasal wall after cutting.

The following technic, developed at the United States Naval Hospital, Philadelphia, has been used in 150 consecutive cases of submucous resection.

A routine submucous resection is performed. A piece of dental pink base plate wax no. 9, 1.4 mm. thick, is placed in a pan of hot water, and a segment of appropriate size is cut (fig. *B*). This piece is then moulded over a medium-sized Killian nasal speculum until a long oval tube of appropriate length is formed (fig. *C*). The tube is first inserted into the nostril of the incised side under direct visual guidance in the manner of an endoscope, to prevent displacement of the flaps. If there is a tendency for the flaps to become displaced during

A, nasal splint; *B*, cut wax for forming tube; *C*, wax tube and speculum (about two-fifths actual size).

insertion, the edges may be protected by an elevator or even sutured. Suturing has been necessary in only about 4 cases.

Another wax tube is then inserted into the other nostril, on the side of the intact flap. Both tubes are deliberately made smaller than required to facilitate insertion. After they are in position, however, the medium-sized Killian nasal speculum is dipped into hot water and quickly placed inside the wax tube. The handle of the speculum is then squeezed, and the wax, which has been heated by the speculum, stretches to the shape desired and is held until it cools. The same procedure is then repeated on the other side. This causes the two flaps to be held firmly in close apposition, while permitting nasal respiration through the lumen of the tubes; thus one of the greatest sources of discomfort to the patient is eliminated. The ends of the wax tubes are trimmed and shaped so that they will fit inside the vestibule of the nose beneath the ala and rarely become

3. Hollender, A. R.: Office Treatment of the Nose, Throat and Ear, ed. 2, Chicago, The Year Book Publishers, Inc., 1946, p. 220.

displaced. If the posterior ends of the tubes become closed during insertion, they may be spread open by means of an elevator or, preferably, a Hartman dressing forceps.

When gauze is removed from the nose after the usual type of packing, the amount of bleeding varies from slight to considerable, and the mucosa is intensely injected. However, when the wax tube is used, there is seldom any bleeding and the mucosa is covered with a coat of clear mucus, which readily permits removal of the tube and also protects the mucosa as it heals.

If there are several lacerations of the flap, the wax tube may be used together with splint (fig., *A*). The splint is placed against the septum and held in place by a wax tube along side it. On the following day the tube may be removed and the wax splint permitted to remain in place. As long as the wax splint is present, crusts will not form, and the clear mucus seems to exert a beneficial effect on healing. The nose may be cleaned by suction and inspected with the splint in position. The patient can retain this splint for as long as five days without harmful or unpleasant effects. In the present series of cases there have been no perforations due to pressure of splints or tubes.

It has been observed by Fleming,[4] Hilding[5] and others that the mucus of the nasal secretion possesses a substance of great antibacterial power. This substance, called lysozyme, has the ability to destroy many pathogenic bacteria even in a 1:100 dilution. Cahn-Bronner[6] and Linton[7] have confirmed and elaborated on the value of nasal mucus. The cilia can function normally only in the presence of a mucous blanket, which is maintained in the presence of wax splints. It is probable that these two factors help to minimize the inflammatory reaction and consequently hasten the repair process.

There have been a few cases of operative bilateral perforation. In these cases a thin slice of fibrin foam was compressed tightly to make a thin, firm splint. This was inserted between the flaps at the site of the perforation, and wax splints were placed against the septal mucosa and held in place by small wax tubes. When splints were removed after four or five days, the mucous membrane seemed to have grown over the fibrin foam and the perforation was closed. Only 1 case of

4. Fleming, A.: On a Remarkable Bacteriolytic Element Found in the Tissues and Secretion, Proc. Roy. Soc., London, s.B. **93**:306, 1922.

5. Hilding, A.: Changes in the Lysozyme Content of the Nasal Mucus During Colds, Arch. Otolaryng. **20**:38 (July) 1934.

6. Cahn-Bronner, C. E.: The Presence and Action of Lysozyme in the Nasal Mucosa, Ann. Otol., Rhin. & Laryng. **51**:250, 1942.

7. Linton, C. S.: Resistance of the Upper Respiratory Mucosa to Infection, Ann. Otol., Rhin. & Laryng. **42**:64, 1933.

persistent surgical perforation remained in this series. The fibrin foam does not have to be removed.

In only 3 of the 150 cases reported (2 per cent) was another form of packing necessary to control bleeding. There were 2 cases in which hematomas developed (1.3 per cent); 1 became infected but healed well after drainage.

SUMMARY

A technic of packing the nose with wax tubes after submucous resection operations is presented. The following advantages are claimed: (1) better and quicker healing of flaps, especially when perforation is present or imminent; (2) ease in removal and minimal bleeding after the removal of the wax; (3) possibility of nasal respiration immediately after operation and minimal postoperative discomfort.

ANALYSIS OF RESULTS OBTAINED IN THE LABYRINTH FENESTRATION OPERATION FOR OTOSCLEROSIS

Report of One Hundred Cases

EDWARD H. CAMPBELL, M.D.
PHILADELPHIA

AT THIS stage in the evolution of the labyrinth fenestration operation for otosclerosis it is, fortunately, unnecessary to advance statistics to prove that the operation is successful in a sufficiently high percentage of cases to make it a valuable therapeutic procedure. Most of those otologists who have either participated in performing this operation or have kept themselves informed on the technical advances and results obtained have considered this development the outstanding advance in modern otology. It is rare indeed to find, at the present time, one who, having familiarized himself with the various features of the operation, its indications and results, will, through unreasonable skepticism, continue to condemn it.

The general surgical technic, its modifications by various otologic surgeons, the operative indications and, in general, the results that have been obtained by the various operators are familiar topics to all otologists and will not be reviewed in this presentation. It seems desirable still to present statistics on operative results—not to emphasize unduly the percentage of successes but to present material that can be analyzed from various standpoints. Careful investigation of the successful cases, especially when associated with operative indications, gives information that may be of considerable prognostic value. Analysis of the failures can lead to a better understanding of the physiologic problems involved and can lead to modifications of surgical technic and management that will improve results. In this presentation an analysis along these lines will be attempted, based on the observation and results obtained in the fenestration operation on 100 consecutive otosclerotic patients, all operated on more than a year ago.

It is generally understood that the results of the fenestration operation should not be considered final until a year, and preferably two years, has elapsed from the operation. However, in the close postoperative follow-up of such cases it has been observed that in cases in which results will be unsuccessful because of closure of the fenestrum, there

Presented before the meeting of the American Otological Society, Hot Springs, Va., April 12, 1948.

is, in the great majority of instances, a recedence of the initially improved hearing between the second and the fifth month after operation and that the hearing in such cases has returned to its preoperative level in six to eight months after operation. In most cases, therefore, indications of subsequent closure of the fistula appear within a few months after operation.

It has become the custom recently, and very properly so, for some fenestration operators to analyze and report their cases on the basis of various degrees of suitability of operative indications. All students of this subject realize that some otosclerotic patients possess ideal operative indications, whereas many have features that, while not ideal, still place them in a class that may be considered suitable for the operation. The prognosis as far as hearing results are concerned will naturally be different in two such groups.

The basis for such classification has been largely the variation of bone conduction hearing. Shambaugh [1] has divided his patients into four classes as follows: ideal, suitable but not ideal, experimental and unsuitable, depending on the bone conduction hearing at the various speech frequencies. House [2] has separated candidates for the operation into three groups: ideal, borderline and nonsuitable, depending on the amount of nerve function present in the speech frequencies (as registered by bone conduction). Moorhead [3] also has divided his cases into three classes according to auditory nerve function and has reported his results in three groups, depending on the level reached in the speech frequencies.

It has been my custom to place patients with otosclerosis into four general groups as far as consideration for the fenestration operation is concerned:

Group 1: Those with less than 35 decibel loss for the speech frequencies. These should not be operated on.

Group 2: Those with more than 35 decibel loss who have ideal indications for operation. These are ideal candidates.

Group 3: Those with fair to good indications but not favorable for the best results.

Group 4: Those with unsuitable operative indications. Operation on these patients is unwise or contraindicated.

The favorable indications mentioned in these groups take into consideration chiefly the cochlear function as registered by bone con-

1. Shambaugh, G., Jr.: The Fenestration Operation: An Evaluation of Its Present Status, Surg., Gynec. & Obst. **84**:828 (May) 1947.

2. House, H. P.: Indications for the Fenestration Operation, Arch. Otolaryng. **45**:312 (March) 1947.

3. Moorhead, R. L.: Fenestration for Otosclerosis: Report of One Hundred and Twenty-Three Cases, Arch. Otolaryng. **45**:49 (Jan.) 1947.

duction, but they consider also such factors as age, condition of the tympanic membrane, amount of tinnitus and psychologic disturbances.

In a patient of the first group in whom the deafness has not advanced to a degree that is handicapping or embarrassing to him, it is hardly justifiable to perform the operation except possibly in very unusual instances. Such a patient does not have complete fixation of the stapes, and it has been found that in some cases of this kind the operation does not give the degree of improvement that is obtained in deafer patients. Furthermore, while the patient's hearing may be improved by the operation, the contrast of the hearing before and after operation is not nearly so great as in deafer patients and he is apt to regard the operation as of little benefit or as a failure.

Within the second group fall those patients who are considered most suitable for the operation because they meet such auditory operative indications as the following:

1. A loss of hearing below the practical level (below an average of 35 decibels for the speech frequencies)

2. Not so great a loss but that a 25 to 30 decibel improvement would bring the hearing above the 30 decibel level

3. Adequate functioning of the internal ear mechanism as determined by (*a*) normal or only slightly reduced bone conduction to the 512, 1024, and 2048 frequencies; (*b*) absence of a profound air conduction loss to 4096 and 8192 frequencies; and (*c*) normal caloric reactions.

The operation on patients in this group gives the most satisfactory results. They are deaf enough before operation to be handicapped; they usually have an associated tinnitus that is frequently distressing, and they have commonly acquired nervous disorders and the speech characteristics of the deafened. When such patients, by means of the operation, have the hearing improved to a useful practical level, the tinnitus lessened or eliminated and the nervousness and speech defects improved, they, as well as the operator, enjoy a high degree of satisfaction.

In the third group can be placed those otosclerotic patients whose indications for operation, while still fair to good, are not of the best for the following reasons:

1. The deafness has advanced to a degree that a 25 to 30 decibel improvement in the speech frequencies will not bring the hearing to the level of practical hearing.

2. The bone conduction for the frequencies 1024 and 2048 has become reduced beyond a favorable level (below a 25 decibel loss).

3. The loss of air conduction for the highest frequencies (4096 and 8192) has reached a profound degree.

Many in this group of patients who have been operated on are pleased with the results obtained, but some are not. In deciding whether or not operation should be done, it is necessary to take into consideration the temperament and disposition of the individual patient, the degree of nervous and psychologic imbalance and the requirements of his business and social life. Frequently in such cases the tinnitus is particularly disturbing, and it has been found that the operation will often lessen this symptom, especially if it is a low-pitched pulsating type of tinnitus.

The fourth group of otosclerotic patients includes those whose deafness has advanced to a profound degree with practically complete loss of hearing to the 4096 and 8192 frequencies and in whom the bone conduction hearing has been reduced below a favorable level in the three speech frequencies. Such patients may still receive from the operation, an improvement of 25 or more decibels to the 128, 256, and possibly 512 frequencies, but this is of little or no practical value. Such patients are not suitable and should not be operated on except in most unusual circumstances.

OPERATIVE RESULTS

In order that a fair estimation of the results of the operation can be obtained, an analysis should take into consideration such various groups of patients. Results on patients in the group in whom the operative indications are ideal should be estimated separately from those on patients in the unfavorable groups. When the operative results obtained in any operator's series are estimated, it will be found that the percentage of successes, the degree of improvement obtained, the level of hearing reached and the satisfaction of the patient will be distinctly less than when the results of the favorable group are estimated separately. It is the custom of some critics to judge the results of the operation on the percentage of the whole number of patients operated on who obtain complete social and economic rehabilitation. Others judge the result by the number of decibels of improvement, regardless of the preoperative level of hearing; for instance, success may be claimed if there is a 15 decibel improvement in the speech frequencies in a patient with profound deafness before operation.

It is well known before operation by the experienced surgeon that many of the patients of the less favorable group will not be improved to the completely rehabilitated state but will be improved to a level that is distinctly helpful to them in their business and social contacts. If this is well understood by the patients before operation, the fenestration operation is justified in many such cases. Experience in the handling of cases of this kind permits of considerable accuracy in estimating the prognosis.

REPORT OF CASES

The statistical material presented has reference to the labyrinth fenestration operation on 100 consecutive patients with clinical otosclerosis, all operated on one year or more ago. The technic used was essentially the nov-ovalis operation described by Lempert [4] with two or three minor modifications. The anesthesia was as follows: (1) preoperative sedation consisting of administration of 3 grains (0.2 Gm.) of pentobarbital sodium ten hours before operation, 3 grains one hour before operation and ¼ grain (15 mg.) of morphine hypodermically one-half hour before operation; (2) local infiltration of the operative site with 1 per cent procaine hydrochloride solution containing a few drops of epinephrine hydrochloride, and (3) light nitrous oxide and oxygen throughout the operation.

The diagnosis of clinical otosclerosis was made for all the patients on the basis of a characteristic history and results of physical examination including careful bone conduction tests with the audiometer and tuning forks. The patients were placed in three groups (groups 2, 3 and 4 of the described classification), one group representing patients with operative indications favorable for the best results, the second group consisting of patients with good indications but not favorable for the best results and the third group composed of patients ordinarily considered unsuitable for fenestration. The results are judged on the comparison of the last audiogram with the average of three or more preoperative audiograms, the average of the 512, 1024, and 2048 frequencies being used.

The results obtained in the 100 cases were as follows:

1. Number of cases with results completely successful (patients obtaining improvement to the 30 decibel level or better and economically rehabilitated), 63 (63 per cent).

2. Number of cases with results considered successful but patients not completely rehabilitated (all receiving 15 or more decibel improvement), 14 (14 per cent).

3. Number of failures, 23 (23 per cent).

4. Number of cases with ideal operative indications and favorable for the best result (group 2), 72. Of this group, 52, or 72.2 per cent, had completely successful results and were rehabilitated; 4, or 5 per cent, had technically successful results, and in 16, or 23 per cent, the operation was a failure.

5. Number of cases with good operative indications but not favorable for the best results (group 3), 20. Of this group, 10, or 50 per cent, had completely successful results and were rehabilitated; 5, or 25 per cent, had technically successful results, and in 5, or 25 per cent, the operation was a failure.

---

4. Lempert, J.: Fenestra Nov-Ovalis, Arch. Otolaryng. **34**:880 (Nov.) 1941.

6. Number of cases with unsuitable operative indications (group 4), 8. Of this group 1, or 12.5 per cent, had completely successful results; 5, or 62.5 per cent, had technically successful results, and in 2, or 25 per cent, the operation was a failure.

7. Average preoperative loss (average of 512, 1024 and 2048 frequencies) in the 63 patients with completely successful results, 46.6 decibels.

8. Average postoperative loss in the 63 patients with completely successful results, 20.68 decibels.

9. Average improvement in the 63 patients with completely successful results, 25.93 decibels.

10. Average preoperative loss in the 14 patients with successful results but not fully rehabilitated, 58.71 decibels.

11. Average postoperative loss in the 14 patients with successful results but not fully rehabilitated cases, 39.28 decibels.

12. Average improvement in the 14 patients with successful results but not fully rehabilitated, 19.43 decibels.

13. Average preoperative loss in the 23 patients with unsuccessful results, 47.13 decibels.

14. Average postoperative loss in the 23 patients with unsuccessful results, 47.65 decibels.

15. Average change of hearing in the 23 patients with unsuccessful results, 0.52 decibels.

These statistics show a decided difference in the percentage of good results that may be obtained in a series of cases with operation grouped according to the operative indications. When the percentage of complete success in all the cases is figured, it is found to be 63, which is a distinct lowering of the percentage found in the most favorable group alone (72 per cent).

COMPLICATIONS

In this series of 100 operated cases there have been some complications which have been disturbing but none which have been at all dangerous. The following are the complications which have occurred in these cases:

1. *Perforation of the Tympanic Membrane.*—This occurred in 4 patients during the operation, and, although the improvement of hearing was delayed in each patient until the perforation had healed, there was nothing to indicate that this accident influenced in any way the end result.

2. *Early Infection of the Operative Area.*—This has been designated early because the infection was noted at the time of the first dressing, three to five days after operation, and apparently the contamination occurred at the time of operation. In this series there were 4 patients with this complication. In spite of the very obvious infection from the start, 3 of these patients made a very satisfactory improvement. However, 2 of them subsequently lost all their early improvement and became

Data on One Hundred Consecutive Fenestration Operations for Otosclerosis

Case No.	Ear	Age	Date of Operation	Average Decibel Loss Before Operation 512, 1024 and 2048	Average Decibel Loss After Operation 512, 1024 and 2048	Average Decibel Change	Time After Operation, Mo.	Fistula Reaction	Classification According to Operative Indications	Average Decibel Loss at Best	Complications	Cause of Failures
1	Right	39	10/20/45	52	20	+32	26	4+	Group 2	20	Perforation of drum membrane	
2	Right	27	12/14/45	55	35	+20	26	3+	Group 2	17	Delayed healing	
3	Left	23	1/ 4/46	47	17	+30	24	4+	Group 2	13	None	
4	Left	39	1/ 7/46	50	34	+16	24	4+	Group 2	34	None	
5	Right	34	1/ 9/46	45	42	+ 3	12	+1	Group 2	12	None	Closure of fistula
6	Right	36	1/14/46	40	23	+17	23	0	Group 2	18	None	
7	Right	35	1/18/46	41	22	+19	12	4+	Group 2	17	None	
8	Left	34	1/21/46	56	22	+34	24	3+	Group 3	22	Delayed healing	
9	Right	20	2/15/46	59	28	+31	23	3+	Group 3	28	None	
10	Right	42	2/28/46	48	58	—10	16	1+	Group 2	25	Infected late	Closure of fistula
11	Left	31	3/ 1/46	51	35	+16	12	3+	Group 3	32	Infected early	
12	Left	47	3/ 8/46	51	22	+29	23	4+	Group 2	15	None	
13	Left	22	3/13/46	50	62	—12	12	3+	Group 3	62	None	Very severe serous labyrinthitis
14	Right	20	3/14/46	40	23	+17	22	4+	Group 2	13	None	
15	Left	32	3/15/46	40	25	+15	15	0	Group 2	25	Infected late	
16	Left	35	3/21/46	49	48	+ 1	16	1+	Group 2	23	None	Closure of fistula
17	Left	36	3/25/46	53	28	+25	21	2+	Group 2	22	None	
18	Left	31	4/ 3/46	40	38	+ 2	8	2+	Group 2	25	Infected early	Closure of fistula
19	Left	30	4/ 4/46	47	55	— 8	17	1+	Group 2	38	None	Closure of fistula
20	Left	43	4/ 5/46	48	27	+21	23	4+	Group 2	15	Delayed healing	
21	Right	49	4/12/46	52	25	+27	20	3+	Group 3	18	None	
22	Right	16	4/15/46	46	20	+26	23	4+	Group 2	15	Perforation of drum membrane; infected early	
23	Right	39	4/18/46	46	20	+26	22	3+	Group 3	15	Delayed healing; constricted canal	
24	Right	37	4/29/46	60	60	0	21	1+	Group 3	40	Extreme nervous factor	Closure of fistula
25	Right	39	5/ 2/46	33	13	+20	18	4+	Group 2	10	None	
26	Right	35	5/ 3/46	46	15	+31	21	4+	Group 2	15	Slighty constricted canal	
27	Left	32	5/ 6/46	46	20	+26	21	3+	Group 2	12	Delayed healing	
28	Right	28	5/ 9/46	54	52	+ 2	12	2+	Group 3	52	None	Faulty operative technic
29	Left	32	5/17/46	44	25	+19	22	3+	Group 2	18	None	
30	Right	25	6/ 5/46	41	10	+31	12	4+	Group 2	10	Temporary facial paralysis	
31	Left	33	6/ 6/46	41	18	+23	15	4+	Group 2	12	None	
32	Left	33	6/10/46	57	23	+34	20	3+	Group 2	18	Wound infected late	
33	Right	38	6/13/46	53	63	—10	12	2+	Group 2	35	Wound infected; perforated drum membrane	Closure of fistula
34	Left	37	6/14/46	53	38	+15	14	1+	Group 2	27	Infected late	
35	Right	40	6/19/46	39	30	+ 9	18	4+	Group 2	30	Temporary facial paralysis	Wrong diagnosis
36	Right	35	6/20/46	47	31	+16	18	1+	Group 2	22	Infected late	
37	Left	20	7/30/46	39	37	+ 2	18	1+?	Group 2	22	None	Closure of fistula
38	Right	30	8/ 6/46	44	28	+16	14	1+	Group 2	20	None	
39	Right	35	8/ 9/46	78	53	+25	12	4+	Group 4	53	None	
40	Left	31	8/12/46	43	25	+18	17	3+	Group 2	25	None	
41	Right	48	8/13/46	38	23	+15	17	3+	Group 2	23	None	
42	Left	42	8/13/46	42	23	+19	12	3+	Group 2	12	None	
43	Right	26	8/22/46	53	22	+31	17	4+	Group 2	12	Constricted canal	

38	Right	30	8/ 6/46	44	28	+16	14	1+	Group 2	20	None	
39	Right	35	8/ 9/46	78	53	+25	12	4+	Group 4	53	None	
40	Left	31	8/12/46	43	25	+18	17	3+	Group 2	25	None	
41	Right	48	8/18/46	38	23	+15	17	3+	Group 2	23	None	
42	Left	43	8/15/46	43	28	+15	15	3+	Group 2	13	None	
46	Right	26	8/22/46	53	22	+31	17	4+	Group 2	12	Constricted canal	
47	Right	43	8/23/46	59	30	+29	19	4+	Group 3	30	None	
48	Right	30	8/26/46	55	20	+35	18	4+	Group 2	15	None	
49	Right	23	8/27/46	36	20	+16	19	4+	Group 2	16	None	
50	Right	28	8/29/46	37	42	− 5	13	1+	Group 2	12	None	Closure of fistula; revised
51	Left	21	9/ 3/46	42	26	+16	13	1+	Group 2	15	None	
52	Right	35	9/ 5/46	48	18	+30	18	4+	Group 2	18	None	
53	Left	27	9/ 6/46	57	23	+34	17	1+	Group 3	22	Constricted canal	
54	Right	38	9/ 7/46	56	48	+ 8	13	3+	Group 4	48	None	Unsuitable operative indications
55	Right	32	9/ 9/46	52	10	+42	17	4+	Group 2	10	None	
56	Left	24	9/10/46	30	16	+14	18	0	Group 2	10	None	
57	Left	53	9/12/46	63	45	+18	15	3+	Group 4	45	None	
58	Right	47	9/13/46	82	50	+32	12	2+	Group 4	50	Constricted canal	
59	Right	39	9/16/46	51	13	+38	16	4+	Group 2	8	Infected late	
60	Right	22	9/17/46	49	27	+22	15	?	Group 2	27	None	
61	Right	25	9/19/46	39	15	+24	15	3+	Group 2	13	None	
62	Left	39	9/20/46	49	18	+31	16	4+	Group 2	18	None	
63	Right	22	9/21/46	36	15	+21	17	3+	Group 2	13	None	
64	Right	30	9/23/46	48	25	+23	12	3+	Group 3	22	Constricted canal	
65	Left	31	9/24/46	55	22	+33	15	4+	Group 2	17	Temporary facial paralysis	
66	Right	57	9/26/46	70	65	+ 5	15	1+	Group 4	50	None	Unsuitable operative indications
67	Right	33	9/30/46	57	13	+44	14	+4	Group 2	13	None	..
68	Right	25	10/25/46	36	38	− 2	15	4+	Group 2	38	None	Wrong diagnosis
69	Right	23	10/28/46	36	20	+16	16	3+	Group 2	17	None	
70	Right	26	10/29/46	40	22	+18	16	3+	Group 2	15	Infected late	
71	Right	36	10/31/46	58	30	+28	16	4+	Group 3	23	None	
72	Left	34	11/ 2/46	45	45	0	12	1+	Group 2	22	None	Closure of fistula; revised
73	Right	19	11/ 4/46	46	45	+ 1	12	1+	Group 2	18	Infected late	Closure of fistula
74	Left	21	11/11/46	36	18	+18	15	4+	Group 2	18	None	
75	Right	43	12/ 6/46	51	36	+15	13	2+	Group 3	32	Infected late	
76	Right	24	12/ 7/46	38	33	+ 5	13	4+	Group 2	30	Infected late	Faulty operative technic
77	Right	20	12/10/46	37	10	+27	13	0	Group 2	7	None	
78	Left	24	12/30/46	37	12	+25	12	4+	Group 2	10	None	
79	Right	35	1/ 7/47	57	25	+32	14	3+	Group 3	25	Delayed healing	
80	Left	49	1/20/47	68	53	+15	12	3+	Group 4	43	None	
81	Right	33	2/11/47	59	38	+21	12	2+	Group 4	25	None	
82	Right	41	2/14/47	43	15	+28	13	4+	Group 2	12	None	
83	Right	32	2/15/47	48	18	+30	12	4+	Group 2	18	None	
84	Left	56	2/17/47	69	30	+39	13	4+	Group 4	23	None	
85	Right	35	3/11/47	46	47	− 1	12	0	Group 2	25	None	Closure of fistula
86	Left	36	3/14/47	45	25	+20	12	3+	Group 2	25	None	
87	Left	49	3/17/47	62	70	− 8	12	0	Group 3	57	Infected early; perforated drum membrane	Infection
88	Left	30	3/18/47	57	25	+32	12	3+	Group 3	18	None	
89	Left	26	3/21/47	33	33	0	12	0	Group 2	33	None	Serous labyrinthitis
90	Left	38	3/22/47	55	48	+ 7	12	0	Group 3	25	Infected	Closure of fistula; revised
91	Left	29	3/25/47	41	22	+19	12	2+	Group 2	10	None	
92	Right	49	3/28/47	44	22	+22	12	4+	Group 2	22	Infected late	
93	Left	24	3/31/47	53	13	+40	12	4+	Group 2	13	None	
94	Left	36	4/ 4/47	46	15	+31	12	4+	Group 2	15	Infected late	
95	Right	36	4/ 7/47	54	33	+21	12	3+	Group 3	28	None	
96	Right	23	4/ 8/47	44	13	+31	12	4+	Group 2	13	Slightly constricted canal	
97	Right	52	4/10/47	41	25	+16	12	0	Group 2	18	None	
98	Left	24	4/28/47	36	37	− 1	12	2+	Group 2	15	Infected late	Closure of fistula
99	Right	29	4/29/47	62	35	+27	12	3+	Group 3	32	None	
100	Right	31	5/ 1/47	49	20	+29	12	4+	Group 2	20	None	

failures, while the third patient retained a very satisfactory improvement past the two year period. The fourth patient received no improvement of hearing at any time.

3. *Late Infection of the Operative Area.*—Fifteen per cent of the patients became infected at some time in the postoperative period. These late infections were largely due to the contamination of the ear cavity by the patient after the bandage was removed from the ear. It resulted in a purulent or seropurulent discharge and frequently the formation of excessive granulations. Such infections were readily controlled by insufflation of a sulfonamide powder or instillation of alcohol or application of methylrosaniline chloride U. S. P. (gentian violet medicinal®). In no case has there appeared to be any deleterious affect on the internal ear mechanism or the final hearing result.

4. *Temporary Facial Paralysis.*—This has occurred in 3 patients (3 per cent). In 2 it began on the fifth postoperative day and in 1 on the seventh. The paralysis became complete within two or three days after it started and began to clear up in approximately three weeks after it had become complete. In every case complete restoration of facial function occurred within seven weeks after operation.

5. *Delayed Healing.*—This has been included as a complication because to the patient it is at times the most annoying feature of the operation. I have placed in this class patients whose ears have not completely healed in eight months after operation. In my series there have been 6 such cases. All these ears eventually healed, but until they did so there was the annoyance to the patient of a serous or purulent secretion in the ear, accumulation of granulations and crusts and frequently a foul odor.

6. *Constriction of the External Auditory Canal.*—This occurred in a mild to moderate degree in 7 patients. There is no danger of development of atresia, and the constriction need not become a serious complication, as the canal can be readily dilated to a satisfactory size by insertion of cotton wedges.

COMMENT

Selection of Patients for Operation.—There is a difference of opinion among otologists on several features pertaining to the selection of patients for the fenestration operation. Some believe that the operation should not be performed on patients with such a severe deafness that improvement to the level of practical serviceable hearing cannot be expected. Day [5] has stated that he considers the operation a failure if the hearing following operation is insufficient for the understanding

5. Day, K. M.: Appraisal of Fenestration Operation: Report of One Hundred Cases, Arch. Otolaryng. **44**:547 (Nov.) 1946.

of normal speech, regardless of the amount of improvement. Others believe that it is entirely justifiable to operate on such patients if the preoperative tests indicate that improvement to a moderate degree can be anticipated. I stand with this latter group because I have operated on several patients with profound deafness whose hearing has improved to the 35 to 40 decibel level after operation and who have been more satisfied and grateful than many of the completely rehabilitated patients. At times such profoundly deaf patients obtain an amazing, unexpected and unexplainable improvement in hearing after operation. Furthermore, it has been found that with a moderately improved hearing there is frequently a reduction of the associated tinnitus which gives decided relief to the patient.

There is also some difference of opinion on the factor of age in selecting patients for operation. I agree with those who believe that the operation need not be refused to persons past 50 years of age if the indications from the auditory standpoint are reasonably good and there are no constitutional contraindications. In this series of cases there were 7 patients 49 years of age or over. Of these, three have had completely successful results, their hearing having been improved to above the 30 decibel loss; 2 have been partially rehabilitated, their hearing having improved 15 and 18 decibels respectively, and results in 2 have been failures. These results are consistent with those in the whole series of cases.

Anesthesia.—Anesthesia for patients undergoing the fenestration operation varies somewhat among the various surgeons. It appears that most surgeons prefer rather heavy preoperative sedation followed by local infiltration of the operative site. After having done more than 100 operations by this method, I have changed my anesthesia to a moderate preoperative sedation followed by light nitrous oxide and oxygen anesthesia throughout the operation. I found that the heavy preoperative sedation produced a rather alarming respiratory depression in some patients and in others was insufficient to prevent restlessness and discomfort through the surgical procedure. With the gas anesthesia there is no movement of the patient whatever throughout the operation and my experience has convinced me that there is no more bleeding from soft tissue and bone, in spite of the possibly slightly elevated blood pressure, from the gas anesthesia than there is in patients who are under some tension and strain as a result of apprehension and discomfort with a local anesthesia.

Operative Technic.—Most surgeons of any great experience with the fenestration operation have made their own modifications of operative technic and do not attempt to follow in all details the technic of any particular operator. Whether the three stage incision of Lempert is

used or the two stage incision without removal of the triangular area of tissue appears to be of no great importance. In some hands, intermittent irrigation during the creation of the fenestra appears to be as good as the constant irrigation technic of Shambaugh in the hands of others. The same applies to the use of high magnification or low magnification. Whether or not the deposit of lead on the edges of the fenestra is of any great advantage remains yet to be decided. The partial, rather than a complete, mastoidectomy appears now to be generally adopted. As Day [5] has mentioned, the air chamber in the external auditory canal should be altered as little as possible to avoid changing the acoustic properties of the ear.

My own changes from the generally accepted technic of Lempert are minor and in my hands appear of some advantage. They are as follows:

1. The two stage endaural incision without removal of tissue is preferred to the three stage incision of Lempert.

2. The head of the malleus is not thoroughly exposed until after the tympanomeatal flap has been dissected free from the bony canal wall. This eliminates the danger of injuring the skin flap during the exposure and removal of the head of the malleus.

3. The fenestra is created, particularly the last stage of exposure of the membranous labyrinth, with as little and as gentle irrigation as possible on the assumption that every slight movement of the membranous labyrinth caused by irrigating fluid is offering some trauma to this structure that may increase the postoperative serous labyrinthitis.

4. All bony prominences and rough areas of the excavated mastoid are made smooth with the large polishing burr. This appears to hasten the covering of the bony surface with skin.

5. The tympanomeatal skin flap is sealed in position over the fenestra with several small rolls of paraffin–mesh gauze and the whole cavity packed with cellulose sponge. I have found this type of sponge better than the sea sponge or any other kind of packing material. It is extremely soft when moist, is very absorbent, is sufficiently elastic, does not adhere to the skin or raw tissue and can be sterilized by boiling or autoclaving without change of its texture.

Fistula Reaction After Operation.—It has been interesting in these cases to observe the response of the labyrinth to the fistula test after operation. The reaction may be entirely negative or there may be any degree of positive reaction from the degree in which the light touch of a cotton applicator to the fenestrated area may nearly throw the patient to the floor to the degree in which only a mild response can be elicited by considerable pressure of the cotton applicator. An extremely active response to the fistula test is considered by most operators a favorable sign so far as the hearing result is concerned. However, at times the

fistula test will elicit no response or a weakly positive reaction when the improvement of hearing has been considerable. At other times there may be no postoperative improvement whatever in the presence of a very active fistula. Explanations for many of these phenomena are entirely lacking at this time. It can be stated, however, that, on the whole, the more active the response to the fistula test the greater is the postoperative improvement of hearing.

There has been some speculation among various operators on the conduction of sound stimuli to the perceptive elements after the fenestration operation. The possibility that the sound waves pass through the round window rather than through the new fenestra has been seriously considered. It appears very unlikely that such is the case. I have observed in numerous instances that the patient will state that during the process of cleaning the ear cavity with cotton applicators subsequent to the operation the light touch of the applicator to the fistula area produces a scraping or scratching sound, whereas a touch of the applicator to the drum membrane itself will produce either no sound or one of much less intensity. I have obtained exactly the same result when a small drop of hydrogen peroxide is placed alternately on the tympanic membrane and on the fistula area—that is, a distinct bubbling sound is heard when the peroxide is on the fistula and little or no sound heard when the peroxide is bubbling on the tympanic membrane. It appears, therefore, that sound stimuli pass directly through the new fenestra and sound stimuli of the same intensity pass through to the cochlear elements much more readily when originating at the skin overlying the fistula than when originating at the tympanic membrane. All observers of patients who have undergone the fenestration operation agree that an intact tympanic membrane is essential for the best hearing after operation, but the physiologic principles involved are still largely a matter of speculation.

ANALYSIS OF FAILURES

Practically all failures following the fenestration operation can be ascribed to one or more of the following causes: (1) closure or partial closure of the fenestra by bony or fibrous growth; (2) wrong preoperative diagnosis; (3) operation on otosclerotic patients with unsuitable indications; (4) postoperative serous labyrinthitis; (5) faulty operative technic, including infections.

Closure or partial closure of the fenestra remains one of the chief causes of failure, but with the meticulous care now employed in creation of the fenestra such closures have been reduced to a low percentage. In this series of 100 cases there were 23 failures, and I have classed 14 of these failures as due to closure or partial closure of the fenestra

(cases 5, 10, 16, 18, 19, 24, 33, 37, 50, 72, 73, 85, 90 and 98). The patients showed satisfactory hearing shortly after the operation and subsequently lost most or all of the improvement. In 4 of these revision was done; complete closure by bone regeneration was found in 3 and partial closure by fibrous tissue in 1. Two of the 4 revisions were successful.

In spite of the greatest care in the examining and testing of patients, occasionally a wrong diagnosis will be made and the patient will receive no benefit from the operation. An apparent response by a patient to bone conduction tests may suggest that he has conduction deafness when actually he has a perception deafness. With the use of every available means of distinguishing between conduction and perception deafness, such as the fatigue test, intensity matching and the articulation test of Walsh and Silverman,[6] this confusion of conduction and perception deafness should seldom if ever occur.

A wrong diagnosis is more likely to be made in the differentiation of otosclerosis and adhesion deafness, which may produce a similar degree and type of conduction deafness. This fact stresses the great importance of obtaining an accurate history of the development of the impairment of hearing and the occurrence of disease of the middle ear. In my cases herein reported there have been 2 failures which I attributed to wrong diagnosis (cases 35 and 68). Neither patient was improved at any time after operation, in spite of the retention of a strongly positive fistula reaction. Subsequent observation has indicated that both had a mixed type of deafness which was predominately perceptive.

Operation on patients with such advanced otosclerosis that they may be classed as unsuitable for operation is occasionally done, and the procedure can be justified in exceptional circumstances. While a few such patients obtain a satisfactory result, the majority are only partially rehabilitated or the procedure fails completely. Of the 8 patients in this group who were operated on in this series, 2 had results which were classed as failures because they received too little improvement of hearing to be of any benefit to them (cases 54 and 66).

Postoperative serous labyrinthitis may be a major cause of failure. In some cases the serous labyrinthitis which ocurs in varying degrees immediately after operation may result in damage to the hearing mechanism. This may permit no improvement of hearing, or there may be some loss over the preoperative level. As the skill of the surgeon

6. Walsh, T. H., and Silverman, S. R.: Diagnosis and Evaluation of Fenestration, Laryngoscope **56**:536 (Sept.) 1946.

improves, particularly in the creation of the fenestra, this complication becomes less frequent. I have classed results in 2 of my cases as failures from this cause (cases 13 and 89).

Failures from faulty operative technic should also become fewer as the surgeon gains greater experience and skill. In spite of considerable experience, however, some faults in the operative technic are not infrequent. The minor errors may have no serious effect on the hearing result, but such errors as severe lacerations of the tympanic membrane or skin flap and damage to the membranous labyrinth are apt to result in complete failure. Results in 3 of my cases (cases 28, 76 and 87) were failures from such errors, 1 patient having had a severe laceration of the tympanic membrane associated with early infection and the other 2 having received severe lacerations of the skin flap.

CONCLUSIONS

The report of this series of cases, with the accompanying table giving detailed statistics on each case, presents material that can be analyzed in a variety of ways. In this presentation the analysis has largely been concerned with the results that have been obtained on the basis of different operative indications, the complications that have occurred and the investigation of the failures. Such an analysis of any series of cases can give information of value from the standpoint of prognosis, can lead to a better understanding of the physiologic problems involved and may suggest modifications of surgical technic and management that will improve the results obtained in the surgical treatment of otosclerosis.

SUMMARY

1. Analysis of the results obtained in the labyrinth fenestration operation for otosclerosis may be made on the basis of various degrees of suitability of the patient's operative indications.

2. Patients with otosclerosis may therefore be placed in four groups as far as consideration for the fenestration operation is concerned, depending largely on their degree of deafness and the amount of auditory nerve function present.

3. The results of the 100 operated cases herewith reported vary considerably according to the suitability of the operative indications.

4. In 63 per cent of this series of 100 cases results were completely successful, the patients obtaining improvement to the 30 decibel level or better; in an additional 14 per cent, results were successful in that the patients received improvement of 15 or more decibels but did not reach the 30 decibel level.

5. It was found that there were several disturbing, but no serious, complications in this series of cases.

6. The results obtained in 7 patients in this series 49 years of age or over were consistent with the results obtained in the whole series of cases.

7. The anesthesia preferred in these cases has been moderate preoperative sedation, procaine hydrochloride locally and nitrous oxide and oxygen throughout the operation.

8. Several minor changes of the Lempert nov-ovalis technic were used in these cases.

9. An analysis of the 23 failures in this series revealed that the chief cause of failure was closure or partial closure of the fenestra by bone or fibrous tissue (in 14 cases). Other causes were wrong diagnosis in 2 cases, operation on otosclerotic patients with unsuitable indications in 2 cases and faulty operative technic in 3 cases.

269 South 19th Street.

SUGGESTED NEW ANATOMIC CLASSIFICATION OF THE TYMPANIC SPACES AND EUSTACHIAN TUBE

Draft of a New Clinical Classification on This Basis

ADOLF SCHWARZBART, M.D.
TEL-AVIV, ISRAEL

THE FIRST detailed description of the human cartilaginous-membranaceous pharyngotympanic canal was given by B. Eustachius [1] as early as 1563. Not long before, G. Fallopius [2] had produced his classic description of the "tympanic cavity." One hundred and fifty years later (1717), A. M. Valsalva [3] presented the description of a bony passage connecting the pharyngotympanic canal of Eustachius with the tympanic cavity of Fallopius, which had not been mentioned by either of the two previous anatomists. He called it the "bony tube" and deemed it fit to weld it and the cartilaginous canal into one anatomic entity which he, paradoxically, named the eustachian tube.

It is superfluous to recall that there was no microscope in general use and that comparative anatomy, embryology, physiology and—even less—anything in the way of clinical otolaryngology in a modern sense had not come into being by that time. There was naturally no conflict deriving from this or any other classification; it was of no consequence.

This state of things and perhaps the supreme authority of an anatomist famous by that time and for a long time to come—to which the law of inertia should be added—may have contributed to the fact that the classification established by Valsalva was preserved unchanged and unchallenged through more than two centuries up to now in science, medicine and otolaryngology.

Conditions have changed thoroughly since the time of Valsalva. The eustachian tube, once and even till lately a neglected item in the domain of medicine, has been pushed to the forefront of clinical interest by the paramount development of modern otolaryngology on the one hand, and of aviation and diving, on the other hand, with clinical analysis focused on such conditions as barotrauma connected closely with the

1. Eustachius, B.: Epistula de auditus organo, in Opuscula anatomica, Venetiis, V. Luchinus, 1564.

2. Fallopius, G.: Observationes anatomicæ, Venetiis, apud M. A. Ulmum, 1562.

3. Valsalva, A. M.: De aure humana tractatus, Trajecti ad Rhenum, G. van de Water, 1717.

morphology and physiopathology of the eustachian tube and the middle ear.

Any one interested thoroughly in otology will admit that there is occasionally a lack of precision in the differential diagnosis of otitic clinical entities, when a sharp division must be made between the eustachian tube and the tympanic cavity. The question therefore rises whether the century old classification, though generally established, is still tenable theoretically and practically.

There may be two sides to this question. Some people may hold that a classification sanctioned by tradition and on which after all modern otology is based should be respected. Others may hold a different opinion. It is my view that the old classification cannot be maintained, that it should be subjected to critical analysis and if necessary, revised lest harm be caused to the further development of science, medicine and otolaryngology. This being my opinion, I propose to give the reasons therefor in this paper.

CRITERIA

Anatomy.—From the anatomic point of view, the human "bony tube" is an anterior prominence of the tympanic cavity and in no basic respect different from the latter except for a funnel-like diminution in size toward the isthmus and a reduction in shape conditional on the proximity of the internal carotid artery medially and the tensor tympani muscle over its roof.

The bony walls run continuously and in an unchanged direction from the tympanic cavity to the bony tube, except for the inferior angle, which varies from obtuse to pointed according to the shape of the bulb of the internal jugular vein bulging upward from below the posterior part of the tympanic cavity.

Whereas in many mammals—for instance, in the dog—those morphologic factors do not interfere, there is no such structure as a "bony tube" and the tympanic cavity opens directly into the membranaceous tube. From the point of view of comparative anatomy, the human bony tube is therefore only an accidental variation in shape of the tympanic cavity as a whole.

Both the tympanic cavity and the bony tube are rigid, permanently open, air-containing (pneumatic) spaces, whereas the lumen of the membranaceous tube is a fine mobile cleft which is, as a rule, almost permanently closed.

The walls of the bony tube (the superior and the medial) take part in the process of pneumatization (tip cells), and in this respect the tube is not different from the tympanic cavity, the mastoid antrum and the other pneumatized spaces of the temporal bone. The cartilaginous tube, on the other hand, plays no part in any process of pneumatization.

Histology.—A fundamental difference prevails between the cartilaginous and the bony tube, the isthmus dividing them sharply. Nothing more dissimilar could be imagined than these two segments of the supposed entity, eustachian tube.

On the one side, there is the thick, succulent, vascular mucous membrane covering a partly cartilaginous, partly membranaceous framework with a ciliated columnar epithelium and many goblet cells, with serous-mucous glands, adenoid tissue and a submucous membrane, this whole histologic picture linking the cartilaginous tube—in every way except for the outer framework—with the nasopharynx and the upper respiratory tract.

On the other side, there is the fine mucous membrane of the bony tube, devoid of any of the characteristics cited, adjacent to the underlying temporal bone through a thin endosteum and covered by an epithelial lining which leads fluently but decisively from the columnar epithelium to the thin single layer of a flat, endothelium-like epithelium as it prevails generally within the mucous membrane of the tympanic cavity and the other pneumatized spaces of the temporal bone. Thus the histologic structure of the bony tube corresponds closely in every respect to those spaces.

Another histologic item should be mentioned separately. It spreads between the epithelial lining and the endosteum, has the histologic structure of embryonal tissue and was first depicted microscopically by Troeltsch,[4] who found it to be present as a thick spectacular layer within the walls of the tympanic cavity of fetuses.

I described[5] this jelly-like tissue in detail, following years long investigations on a series of petrous bones. I found it—otherwise than Troeltsch—to be present as a rule (*a*) not only within the walls of the tympanic cavity but also all over the pneumatic spaces of the temporal bone, including the bony tube, where it ends sharply close to the isthmus, and (*b*) not only in the fetus but also in the adult.

I called this tissue—for reasons not to be explained in this short paper—"pneumatization tissue." This tissue, which is never found within the cartilaginous tube, is a paramount criterion of fine histologic significance, disrupting the artificial entity of the eustachian tube and indicating that the bony tube belongs with the rest of the tympanic spaces as a single histologic entity.

Embryology.—From an embryologic point of view, reference may be made to the research work of J. E. Frazer[6] concerning early stages of

4. Troeltsch: Arch. f. Ohrenh. **1**:15, 1864.

5. Schwarzbart, A.: Die fetale und postfetale Tuba Eustachii: Anatomisch-histologische Untersuchungen, Cracow, Imprimerie de l'Université, 1938.

6. Frazer, J. E.: Brit. M. J. **2**:1148, 1910; J. Anat. & Physiol. **48**:391, 1914; **57**:18, 1922-1923.

fetal development in man. According to Frazer, the origin of the cartilaginous tube is different from that of the tympanic cavity.

My investigations made on fetuses strongly support this conclusion.[5] I do not propose to go here into details of this interesting topic. The fact remains that also according to embryologic observations the cartilaginous tube is a separate and distinct item.

Most of the facts pointed out in this morphologic survey are, no doubt, well known to the reader. Yet the question remains: Should the conclusions not be drawn and put into effect where classification is concerned? The arguments are stringent.

The arguments of morphology are supported and even overshadowed in weight by the arguments supplied by physiology and clinical observations. This is not surprising, since structure and function are mutually interdependent.

Physiology.—Much was said in the past about the physiology of the eustachian tube. The investigations of Itard (1821), Johannes Mueller (1840), Toynbee (1863), Clébaud (1868), Voltolini (1868), Mach and Kessel (1872), Yule (1874), Poorten (1874), Zaufal (1877), Politzer (1878) and Hartmann (1879) may be mentioned incidentally. E. P. Fowler, E. P. Fowler Jr., S. A. Kopetzky and G. E. Shambaugh are among those who have been making valuable contributions up to the present day.

It is interesting to state that whatever was said in the past and is being said in the current literature about the physiology and physiopathology of the eustachian tube is related obviously to the cartilaginous-membranaceous segment exclusively. It is so of necessity. It is this segment only which, through its elastic cartilage and the active muscular opening and closing apparatus, through its rich vascular supply susceptible to shrinking and congestion and through its defensive barrier of a mucous membrane rich in glands and adenoid and phagocytic tissue, is responsible for safeguarding adequate air pressure and biologic integrity of the middle ear, as indispensable conditions for a faultless acoustic function.

The function of the bony tube, itself a rigid pneumatic space, is precisely the same as is that of the middle ear as a whole. This function is the conduction of sound, to which the basic physiology of the cartilaginous tube is of auxiliary consequence only. Whatever, therefore, was or is being said about physiology and physiopathology of the tympanic and paratympanic cavities is—though this fact is usually not realized—necessarily related also to the bony tube.

Pathologic and Clinical Observations.—What is true in a normal condition is not less true in case of a pathologic function of the tube. It is hardly necessary to dwell too long on this issue.

Whenever symptoms of impaired permeability or of stenosis or occlusion of the tube occur—whether transient, lagging only temporarily or of long standing—the upper respiratory tract, the nasopharynx, the pharyngeal orifice of the tube and, above all, the cartilaginous tube itself—and not the bony tube—are involved.

Only secondarily, by way of propagation of reaction, the tympanic cavity and the bony tube become the site of a pathologic condition. This is liable to occur when ventilation fails and inflammatory, infective or allergic factors strike beyond the threshold of the isthmus tubae, the boundary line and landmark of a vast domain susceptible and exposed to a host of all kinds of noxae likely to occur in the upper respiratory tract. Pathologic and clinical observations on the cartilaginous tube should therefore always be considered as a part of the observations on the upper respiratory tract, though appropriate stress should be given to the clinical peculiarities of the tube due to its concealed position, cleftlike structure and important function with regard to the acoustic organ.

Pathologic and clinical observations on the tympanic cavity and the bony tube, on the other hand, are of an entirely different nature. The bony tube is closely related in every respect to the pneumatic spaces of the temporal bone, whether the mucous membrane alone or also the bony capsule is involved.

Before I close this analysis, it is necessary to point out that there are, of course, cases in which conditions of the cartilaginous tube and of the tympanic spaces occasionally occur together, thus obscuring any sharp division. Even then a strict distinction of the two sources of pathological involvement makes it easier to appreciate properly the condition as a whole.

CONCLUSIONS

The conclusion to be drawn from this analysis, including morphology, physiology and pathology, is that the eustachian tube as presently defined is a conglomerate of two totally heterogeneous entities welded together artificially and that any classification, clinical or other, based on it is necessarily wrong and leading to inaccuracy. There can be no doubt that this has injurious effects on differential diagnosis and treatment.

I suggest, therefore, that this hitherto established entity, the eustachian tube, be abolished and replaced by adequate substitutes.

Suggested Classification.—1. The cartilaginous tube may be called simply "the tube" (one could also apply to it, but to it only, the name "eustachian tube," since it conforms roughly to the original description by this author, though later research brought in many new details).

Inflammatory and similar conditions of this segment could then be called tubitis. (Salpingitis is reserved for the uterine tube.)

2. I suggest that the purposes of clinical nomenclature are best served if the nasal part of the pharynx, usually called nasopharynx and sometimes rhinopharynx, is called epipharynx. Then misunderstandings will be avoided. The common condition, for instance, of rhinitis, epipharyngitis and tubitis would then be called rhinoepipharyngotubitis, which with the other terminology would be impossible to express simply.

3. There is no clinical significance in the four century old delimitation of Fallopius who likened the middle ear space "cum tympano militari" (and called it therefore "tympanic cavity," quoted from Fallopius "Observationes anatomicae" literally). This tympanic cavity should be deprived of its dominant and somehow exclusive position and integrated into clinically significant broader entities.

I suggest that the bony tube should, in analogy with the hypotympanum and epitympanum (attic) be called the protympanum—that is, the anterior prominence of the tympanic cavity.

The part corresponding roughly to the tympanic cavity of Fallopius and located about at the level of the tympanic membrane, below the epitympanum, above the hypotympanum and behind the protympanum, might then be called the mesotympanum. It is delimited anteriorly by the so-called ostium tympanicum tubae. It should be pointed out here that this boundary line is—contrary to the hitherto adopted rules of classification—both morphologically and clinically irrelevant. The fact that is of clinical importance is that there is a cavity comprising protympanum, mesotympanum and hypotympanum. This space is the site of the usual otitis media, whether serous (exudative or catarrhal) or purulent. It is retort-like in shape, the protympanum forming its neck and the hypotympanum its fundus.

I suggest that the space comprising the four segments of the mesotympanum, epitympanum, hypotympanum and protympanum be united by a common denomination.

The space has roughly the shape of a quadrangular pyramid with its base cutting through the aditus ad antrum and its four walls (superior, inferior, medial and lateral) tapering toward the isthmus tubae. The inferior wall is more or less angular; the others, nearly flat.

Though the vault of this space is interrupted in vivo by ossicles and ligaments, it is of paramount clinical significance as the usual site of more complicated forms of otitis media.

I would suggest that this space be called the bitympanum. The advantage of the word lies in its brevity. Any other designation would do as well.

The last suggestion to be proposed here is an inclusive term for all pneumatic spaces of the temporal bone, including the bitympanum,

aditus, antrum mastoideum and other cells. I would call it pantympanum. It comprises the space where the usual mastoiditis spreads.

Draft of a Clinical Classification.—Middle Ear: It is not proposed in this paper to present an exhaustive clinical classification. The reader will readily find out himself the convenience of such clinical entities as, for example, mesotympanitis, epitympanitis, bitympanitis, pantympanitis and the like, based on the analysis. Use of these terms might offer a more clearcut delimitation than has been possible as yet. They have more clinical significance than the vague diagnosis of otitis media. This latter diagnosis will have on many occasions to be replaced by one of such new entities. The inclusion of the bony tube—the protympanum—among the tympanic cavities might thus widen the clinical scope of otology in the long run.

Tube: The nomenclature for the tube may be controversial. Having reduced the tube to its cartilaginous-membranaceous segment and emphasized its integrity and its close clinical connection with the epipharynx and the upper respiratory tract, we face new problems of nomenclature. The cartilaginous segment we should call simply "tube," as I mentioned previously.

I reserve details to another occasion and to constructive suggestions on the part of other otolaryngologists. I reduce my remarks to the suggestion, already mentioned, that any catarrhal or inflammatory condition concerning the tube should be called "tubitis." There is no other way open. It could be called "eustachitis," but I am opposed to using names of authors in diagnoses. The sound of tubitis is dissonant, but has the advantage of conciseness and unequivocality. We shall get used to it. Whatever the name, the point is that we have done, once and for all, with the confusion still prevailing about the eustachian tube.

May I hope that by these remarks some morphologic and clinical definitions may become simplified and more precise and that expediency in treatment of tubal and otitic conditions may occasionally be favorably influenced by them through increased clarity in classification and diagnosis based thereon.

These suggestions are offered after years of research, and clinical experience and I shall be glad if otologists will express their opinions on the matter.

SUMMARY

A new classification for the eustachian tube and the middle ear spaces and for the respective pathologic conditions is suggested. Items of a new nomenclature are suggested. The reasons for the advantages of these suggestions are explained.

5 Rosenbaum Street.

Clinical Notes; New Instruments and Technics

A NEW ESOPHAGOSCOPE

MARTIN HENRY, M.R.C.S., L.D.S.
LONDON, ENGLAND

THE ESOPHAGOSCOPE has been an instrument designed without due regard to the characteristics of the organ which it is intended to inspect; for example, there has been a tendency to design this instrument as if it were a half brother to a bronchoscope. A notable example is the Chevalier Jackson esophagoscope, which is practically a bronchoscope with the lateral perforations omitted.

The two types of instruments now in common use are the Chevalier Jackson (distally illuminated), in the United States, and the Negus (proximally illuminated), in England. Both these instruments have disadvantages. The Negus type is poorly illuminated at the distal end, as the lamp-carrying tubes are soldered into the sides of the esophagoscope, and do not accurately aline, the lights at the distal end. In the Chevalier Jackson instrument, the lamp-carrying and suction tubes are in such a position that the longest diameter of the instrument is anteroposterior, whereas the longest diameter of the esophagoscope at its upper orifice is lateral, being compressed between the larynx and the posterior pharyngeal wall and held in this position, except during the act of deglutition, by the cricopharangeal muscle. Furthermore, in the designing of this instrument, it has apparently not been realized to what an enormous extent the esophagus is dilatable.

In my opinion, the chief limitation for the size of an esophagoscope which can be passed is not the size of the esophagus, but the anteroposterior space between the upper and the lower teeth. In the case of young children, the removal of upper and lower anterior teeth is justifiable in case of difficulty. Assuming this premise to be correct, the esophagoscope suitably shaped can be a tube with a much larger lumen than the classic Chevalier Jackson type.

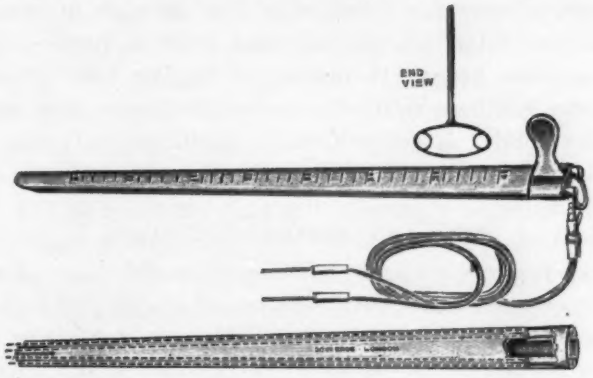
In practice, the instrument is much more easily introduced if it is a large one rather than a small one. For the purpose of a larger field at the distal end, it is also desirable that the illumination should come from the proximal end, the disadvantage hitherto being that in the proximally illuminated instruments the light at the distal end, i. e., that nearest the esophagus, was not good. This was due to the fact that in the most commonly used type, the Negus, the rays from the lamp-carrying tubes are not correctly alined, so that their full capacity is not evenly distributed at the distal end. As a matter of fact, half the light from each bulb illuminates merely the lateral wall of the instrument. To overcome this difficulty, I have designed an esophagoscope in the form of a flattened oval in section with a continuous taper from the distal to the proximal end, so that the latter is much larger than the former.

The lamp-carrying tubes are very short and are carried inside the main tube, these tubes being so positioned that the total light rays from both bulbs are concentrated equally at the distal end. The result of this is that there is at least a 50 per cent increase in light available where it is most needed. A further advantage is that the encroachment of the lamp-holding tubes on the lumen of the

main tube at its proximal end produces four corners, down which the shaft of any operating instrument can be led, thus leaving the operator's view entirely unobstructed.

The suction tube, which is incorporated in the Chevalier Jackson instrument, has been omitted, a separate suction tube being inserted during the introduction of the instrument as needed. The posterior wall of the distal end is cut well back, thereby lessening the risk of damage to the esophagus where it rests on the vertebrae.

The technic adopted with this instrument is not to drop the head of the table or to place the patient in such a position that his head is clear of the table (Boyce position), but to place a sandbag under the shoulder blades, one assistant gently pressing the scapulas against the sandbag and another assistant controlling the head, with the left hand on the occiput and the right beneath the neck, controlling whatever kind of gag is used. The advantage of this is that the assistant's left elbow has the support of the head of the operating table and the patient's head is thus much more easily maintained in any position required by the surgeon. As long as the patient's nose is kept projecting directly upward, there is no need



A new esophagoscope.

with this instrument to use esophageal bougies for the purpose of finding the way into the esophagus. If the instrument is kept in the midline, it must slide gently down the posterior pharyngeal wall and find its way past the cricoid cartilage.

General anesthesia is to be preferred with intubation, thereby insuring a good airway. If deglutition is possible, a small dose of liquid petrolatum U.S.P. is swallowed immediately before induction, thus lubricating the esophagus before the use of the esophagoscope.

Good illumination and the use of the largest esophagoscope possible makes esophagoscopy a simple operation. It is generally possible to remove the usual types of foreign body within a few minutes after the introduction of the instrument.

These esophagoscopes are made in the following sizes: 30 cm., for children; 40 and 30 cm., for small-sized adults; 40 and 30 cm., for medium-sized adults and 40 and 30 cm., for edentulous adults.

66 Harley Street. W.1.

Progress in Otolaryngology

Summary of the Bibliographic Material Available in the Field of Otolaryngology

REVIEW OF ALLERGY FOR 1946

E. L. MacQUIDDY, M.D.
AND
E. A. HOLYOKE, M.D.
OMAHA

INTRODUCTION

DURING this year, with the war over and the armed forces rapidly reducing personnel, the number of reports on allergy from the military point of view has fallen off. This decrease in literature has been more than offset by the increased interest, particularly in the new antihistamine drugs. A number of regular contributors to the literature who had been relatively inactive during the war are actively writing again, and a larger volume of significant work has appeared in 1946 than appeared in several previous years.

NOSE AND PARANASAL SINUSES

Thacker [1] presents a series of 170 cases in which the patients complained of perennial nasal symptoms, nasal obstruction in particular. In 23 per cent of this group the disease was due to inhalants, in 27 per cent to ingestants and in 50 per cent to both. Twenty-seven per cent of the patients had asthmatic attacks, and, of these, 52 per cent reacted to both inhalants and foods, 33 per cent to inhalants alone and 11 per cent to foods alone. In 70 per cent of the cases nasal smears contained eosinophils. Sixty-three per cent of the group were relieved by elimination of the causative allergen, 7 per cent by specific desensitization. Submucous resection was done in 7 per cent. Iodine, aminophylline and diphenhydramine hydrochloride (benadryl hydrochloride®) were used on some patients and submucosal injection of the turbinate bodies was done on 14, with excellent results in 11 and moderate relief in 3.

Sprague and Aaron [2] review a series of 46 cases of perennial allergic rhinitis. House dust and feathers were found to be the most important allergens in these cases. A tabulation is given of the serious com-

1. Thacker, E. A.: Chronic Nasal Obstruction: Its Causes and Treatment, J. A. M. A. **131**:1039-1045 (July 27) 1946.

2. Sprague, R. H., and Aaron, T. H.: Experiences in the Treatment of Perennial Allergic Rhinitis, Canad. M. A. J. **55**:548-552, 1946.

plications in the group, such as asthma and persistent cough. Elimination of allergens and desensitization treatment were followed by improvement in 73 per cent of the cases. In 43 per cent the improvement was prolonged. Desensitization with house dust extract was carried out at monthly intervals over a period of six months to two years.

Hamlin [3] gives an analysis of 100 cases of allergy encountered in routine nose and throat practice. He lists the following series of complaints in this group: watery discharge from nose, 13; stuffy nose, 37; headache and dizziness, 16; hoarseness, 8; deafness, 5; tinnitus, 5; sore throat, 4; asthma, 3; constant colds, 8, earache with headache, 1. Thirty-six of the patients proved to be "skin sensitive to epidermals," 34 to foods, 13 to pollens and 17 to bacteria. Satisfactory results were obtained in 45 patients by allergic management and various surgical procedures. In 14, results were unsatisfactory. Hamlin concludes that better results could have been obtained in this group if the conditions had been recognized as of allergic origin and more attention given to them during the patients' childhood. He believes that with more investigations for allergy there would be less need for operations on the nose.

Houser [4] gives the following classification of patients with nasal allergy: (1) those with suspected allergy; (2) those with definite allergy without demonstrable sinus infection; (3) those with definite allergy with sinus infection; (4) those with definite allergy with polyposis, and (5) those with definite allergy, with polyposis and sinus infection. A good deal of emphasis is given to the frequence and importance of these conditions. Methods of diagnosis and treatment are suggested for each class of patients, consisting for the most part in conservative measures in the treatment of those of class 1 and surgical intervention if necessary to eliminate the infection and obstruction in the other classes. Such measures as use of sclerosing solutions and galvanic current to promote scar formation are said to give good results in some cases.

Robison [5] has published a detailed description of the pathologic processes involved in allergy of the nose and paranasal sinuses. He is of the opinion that tissue fluid stagnation due to lymphatic blockage or lowered tissue pressure is important in the pathogenesis of allergic

3. Hamlin, F. E.: Investigation of Allergy in Routine Nose and Throat Practice, Virginia M. Monthly **73**:45-50, 1946.

4. Houser, K. M.: The Allergic Nose, Arch. Otolaryng. **44**:565-567 (Nov.) 1946.

5. Robison, J. M.: Physiology and Functional Pathology of the Lymphatic System Applied to Allergy of the Nose and Paranasal Sinuses, J. Allergy **17**:53-69, 1946.

sinusitis. Following irritation, a normal response of the mucosa involves an increase in capillary permeability with dilatation of the interstitial spaces. When the edematous mucosa entirely fills the cavity of the sinus, driving out the air, the lymph is pumped out of the part by the pulsations transmitted to the lymph vessels from the dilated arteriovenous anastomoses. The tendency toward development of chronic infection in large sinuses (which the edematous mucosa cannot fill) is explained by the consequent failure of this mechanism. The mechanism also fails when the mucosa becomes fibrotic in chronic sinus disease. Polypi are formed as a result of dilated lymph spaces. Rational therapy, according to Robison, thus involves aiding the removal of the excess fluid from the edematous mucosa of the sinus by application of local pressure; a method for accomplishing this in the maxillary sinus is described.

E. A. Brown and his co-workers [6] have measured the vital capacity in patients with hay fever. The series of patients was carefully controlled, and the results were subjected to statistical analysis. Diminished vital capacity was found in many patients during their pollen seasons. Patients with coincidental sensitivity to inhalants showed greater variation than those for whose disease there was a single causative agent. Variations in vital capacity tended to be greater in patients with bronchial asthma due to sensitivity to pollens (even though they did not complain of bronchial asthma) and in those in whom the condition was complicated by nasal or pulmonary infections. The variation in vital capacity did not, however, seem to be an index of prognosis. It is suggested on the basis of these studies that the respiratory tract tends to react as a single organ, regardless of the seat of symptoms complained of by the patient. It is further suggested that studies of a larger series of patients and for a longer time may prove how quickly dyspnea, which may be the earliest sign of bronchial involvement, may be associated with latent bronchial asthma.

Feinberg [7] discusses mold allergies and describes the various clinical manifestations. There are several modifications of the clinical picture of respiratory allergy:

1. The largest group of patients have the "summer" type. The chief complaint is usually hay fever or asthma. As with pollinosis, the hay fever symptoms are apt to appear first and the asthmatic symptoms later. The worst months are likely to be July, September and October. Some patients may have symptoms from early March to late November.

---

6. Brown, E. A.; Nobili, C.; Sannella, T., and Wadsworth, G. P.: Dyspnoea and Diminished Vital Capacity as Symptom and Sign in Hay Fever, Dis. of Chest **12**:205-221, 1946.

7. Feinberg, S. M.: Mold Allergy, Clinics **5**:576-588, 1946.

2. A smaller group have symptoms in the spring and fall months but are relatively free in midsummer.

3. In another group rhinitis develops in the summer and a cough in the winter.

4. A final group have perennial rhinitis or asthma. In this group the disease usually occurs on an occupational basis or in patients of extreme sensitivity.

The molds commonly causing allergy are discussed and the following types and genera are recommended for use in testing: yeast, smut, Alternaria, Hormodendrum, Helminthosperium, Aspergillus, Cephalosporium, Candida (Monilia), Penicillium, Mucor, Fusorium, Phoma, Botrytis and Trichophyton.

Desensitization with mold extracts gives satisfactory relief in 80 to 90 per cent of mold-sensitive patients.

Spain [8] and Graham [9] have published reviews on the problem of seasonal allergic rhinitis, or hay fever, covering symptoms, diagnosis, pathogenesis, complications and treatment. Spain discusses the various methods of preparation of pollen extracts and points out briefly the large variety of products available. He outlines a perennial course of treatment with repetition of maximum doses of extracts at monthly intervals or more frequently in extremely sensitive patients.

Allergic rhinitis is similarly reviewed by Criep.[10]

The examination of nasal smears for eosinophils has been recommended by Mansmann [11] in every patient with nasal secretions, especially if treatment is to be long continued or if any operative procedure is contemplated. For the staining of nasal smears he suggests use of Wright's stain one and one-half times the strength used in routine blood examination.

Dutton [12] expresses the opinion that stains such as Wright and Giemsa are not very satisfactory for use on nasal smears because of the variations encountered in the p_H of the secretions. He uses an eosin–methylene blue stain differentiated for about ten seconds in a mixture of equal parts of 95 per cent ethyl alcohol and acetone. Dutton recommends examination of the slides with a low power objective before use of the oil immersion lens because of the small field covered by the latter. He emphasizes the importance of proper methods of obtaining material.

---

8. Spain, W. C.: Hay Fever, Clinics **5**:396-413, 1946.

9. Graham, W. R.: Allergic Rhinitis: Seasonal Type, South. Med. & Surg. **108**:169-173, 1946.

10. Criep, L. H.: Allergic Rhinitis, Clinics **5**:482-503, 1946.

11. Mansmann, J. A.: The Study of the Eosinophile in Allergic States, Am. J. M. Technol. **12**:25-30, 1946.

12. Dutton, L. O.: Nasal and Sputum Smears, Ann. Allergy **4**:138-140, 1946.

HEADACHE

Williams [13] suggests a physical allergic origin for vasomotor rhinitis, vasodilating pain syndrome, myalgia and endolymphatic hydrops and presents reasons for including all four of these conditions in the common syndrome of physical allergy of the head.

Crowe [14] reviews the question of headache. His study is based on 100 subjects, 63 females and 37 males. Migraine, he feels, is on the basis of localized or generalized cerebral edema with consequent increase in intracranial pressure. Food sensitivity was found to be the commonest cause, with cereals, legumes, sea food and cow's milk the chief offenders. To the psychologic aspect he ascribes second importance and states that the factors involved are psychoneurotic. There were no psychotic or mentally defective patients in the group. Sensitivity to inhalants, physical allergy and glandular deficiency are also considered as causes.

MÉNIÈRE'S SYNDROME

Atkinson [15] expresses the belief that Ménière's syndrome is primarily dependent on either increased capillary permeability or vasospasticity. The increased permeability may, in turn, be due to infection, allergy or vitamin C deficiency. Histamine sensitivity may be a responsible factor. He feels that while restriction of water and sodium intake (recommended by Furstenberg [16]) or increase of potassium intake may be of value in limiting the amount of fluid escaping through the permeable capillary bed, more fundamental treatment (with histamine or nicotinic acid) aims at overcoming the increased permeability of the capillaries.

Lindsay [17] expresses doubt concerning the allergic basis of Ménière's syndrome in more than a small percentage of patients. He considers the syndrome a symptom complex characteristic of several separate diseases of the inner ear which he discusses in his paper.

Poos,[18] in a discussion of vertigo, mentions allergy and excessive histamine formation as common causes. He considers Ménière's syndrome briefly and lists points of differentiation between this condition and Lermoyez's syndrome.

---

13. Williams, H. L.: The Syndrome of Physical or Intrinsic Allergy of the Head, Proc. Staff Meet., Mayo Clin. **21**:58-64, 1946.

14. Crowe, W. R.: Headaches, Ann. Allergy **4**:216-219, 1946.

15. Atkinson, M.: Ménière's Syndrome: The Basic Fault? Arch. Otolaryng. **44**:385-391 (Oct.) 1946.

16. Furstenberg, A. C.; Richardson, G., and Lathrop, F. D.: Ménière's Disease: Addenda to Medical Therapy, Arch. Otolaryng. **34**:1083-1092 (Dec.) 1941.

17. Lindsay, J. R.: Ménière's Syndrome, J. Indiana M. A. **39**:23-26, 1946.

18. Poos, E. E.: Functional Pathology of Vertigo, Eye, Ear, Nose & Throat Monthly **25**:448-454, 1946.

Day [19] recommends surgical destruction of the labyrinth in Ménière's disease resistant to conservative measures. He reports a high degree of success in relieving the symptoms but warns that the operation usually destroys hearing on the involved side.

Nelson-Jones,[20] in a review of Ménière's disease, points out that at times the attacks of vertigo may be accompanied with general disturbances of the vegetative nervous system and that a primary gastrointestinal condition may be simulated. He outlines a conservative system of treatment, recommending operative destruction of the labyrinth only if other measures are ineffective.

Scal [21] has tried benzyl cinnamate in Ménière's syndrome and reports decreased dizziness in 8 of 20 patients. The tinnitus was cleared in 4 and diminished in 2, while hearing was improved in 5. Scal found some annoying side effects, including insomnia and increase of tinnitus, in some patients. He states that, although the results were not entirely satisfactory, further trial of the drug is warranted.

EYE

An extensive review of allergy of the eye and its adnexa has been published by Duggan.[22] The literature on the subject is well covered. The author considers as allergic all lesions which are aseptic or nonbacterial and which center around increased capillary permeability or excessive contraction of smooth muscle or both. Since, except for the muscles of the iris and the ciliary body, smooth muscle in the ocular region is limited to the arteries and arterioles, allergy of the eye is chiefly a vascular problem. The various conditions reviewed in this paper are included because they meet the requirements set forth or are considered by some authorities to be of allergic origin. No attempt is made to prove their allergic basis. Duggan is of the opinion that all of the lesions studied depend on some stimulus causing arteriolar spasm with fatigue and relaxation of the capillaries. The flow in the capillary bed is slowed, and the resulting anoxia causes increased permeability. Depending on their degree, the resulting conditions can be classified as prestasis (plasma transudate), peristasis (with escape of white cells into the perivascular spaces) or stasis (passage of erythrocytes through the capillary walls). On this basis,

19. Day, K. M.: Hydrops of the Labyrinth (Ménière's Disease): Diagnosis—Results of Labyrinth Surgery, Laryngoscope **56**:33-42, 1946.

20. Nelson-Jones, A.: Ménière's Disease, Practitioner **156**:384-387, 1946.

21. Scal, J. C.: Benzyl Cinnamate in the Treatment of Ménière's Syndrome and Tinnitus Aurum: Clinical Report, Eye, Ear, Nose & Throat Monthly **25**:150, 1946.

22. Duggan, W. F.: Vascular Basis of Allergy of the Eye and Its Adnexa, Arch. Ophth. **36**:551-611 (Nov.) 1946.

Duggan discusses the etiology of such conditions as acute congestive glaucoma, cyclitis and endocyclitis, herpes zoster opthalmicus, paralysis of ocular muscles, various conditions involving the retina, optic nerve and iris, acute exudative choroiditis and others. Therapy is directed toward promoting vasodilation (by sodium nitrite in 100 mg. doses intravenously or 15 to 30 mg. of erythrityl tetranitrate twice daily). Duggan states: "In my opinion, allergy of the ocular tissues may be considered an acute localized vascular catastrophe which is the result of arteriolar spasm or increased capillary permeability or both. Tissue anoxia and loss of function are the immediate results."

De Roetth,[23] in a statistical presentation of 1,000 consecutive new cases of ocular disease, reports that he found 19 to be on an allergic basis.

Bettman[24] reports a case of allergic retinosis in a highly allergic patient otherwise in excellent health. In this patient, edema of the macula suddenly developed, and the visual acuity fell from 20/50 to 20/200. Within a half-hour after administration of epinephrine the visual acuity increased, to fall again later. The edema of the macula subsided after several days of epinephrine therapy. A brief review of the literature on retinal allergies is included in the report.

Bothman[25] reviews 6 cases of iritis with recurrences after removal of all foci of infection. All the patients were found to be allergic to molds and certain foods. Treatment was not particularly successful, since only one of the group would cooperate fully. Bothman feels that allergy plays a definite role in some cases of iritis.

Chamberlain and Boles[26] describe edema of the cornea following the use of quinacrine (atabrine®), and Hoffman[27] has reported a case of retinal venous thrombosis following combined typhus and typhoid vaccination.

Penicillin by local application is cited as a cause in 2 cases of ocular dermatitis by Schultz,[28] while Benkwith[29] reports a severe reaction following topical use of calcium penicillin in blepharoconjunctivities. Other allergic reactions have been encountered from scotch

23. de Roetth, A.: Statistical Analysis of One Thousand Consecutive New Eye Patients, Am. J. Ophth. **28**:1329-1334, 1945.

24. Bettman, J. W.: Allergic Retinosis, Am. J. Ophth. **28**:1323-1328, 1946.

25. Bothman, L.: Allergic Iritis, Illinois M. J. **89**:124-130, 1946.

26. Chamberlain, W. P., Jr., and Boles, D. J.: Edema of the Cornea Precipitated by Quinacrine (Atabrine), Arch. Ophth. **35**:120-134 (Feb.) 1946.

27. Hoffman, P. M.: Retinal Venous Thrombosis Following Reaction to Vaccine: Report of Case, Arch. Ophth. **35**:45-46 (Jan.) 1946.

28. Schultz, A.: Ocular Dermatitis from Local Penicillin: Report of Two Cases, Arch. Ophth. **35**:145-149 (Feb.) 1946.

29. Benkwith, K. B.: Allergy to Penicillin Calcium Topically in Blepharoconjunctivitis, U. S. Nav. M. Bull. **46**:279-280, 1946.

tape (Benkwith [30]) and the so-called beach apple in the South Pacific (P. C. Grana [31]) which produced a severe dermatitis and conjunctivitis. Thygeson [32] found that in his series of cases allergy played no etiologic role in marginal blepharitis. There were, however, a number of cases of allergic involvement of the entire lid area which he considers as contact dermatitis from cosmetics or as due to drug sensitivity. Contact dermatitis from penicillin and sulfathiazole was not found frequently enough to preclude a trial of those drugs when indicated.

Feinberg [7] states that conjunctivitis is common in patients with rhinitis due to mold allergy and that primary conjunctivitis on this basis may occur occasionally.

ASTHMA

There has been considerable discussion of "infectious asthma" and the part bacteria may play in allergies in general.

Davidson [33] considers the term bacterial allergy a misnomer. He states that reactions such as those encountered in the tuberculin test are due to lack of immunity and depend on neutralization of the small quantity of antibodies ordinarily present by an infection elsewhere. Cutaneous tests with true allergens, on the other hand, indicate hypersensitivity. Tuft [34] is also rather doubtful of bacterial allergy in most cases of asthma, even in the older age group. He is of the opinion that these patients fail to respond to the removal of specific allergens because of permanent damage over a long period. Forman [35] looks on virtually all cases of asthma as of allergic character but considers that in a large percentage of older patients the disease belongs in a nonatopic group.

Scherp,[36] on the other hand, is convinced that sensitivity to infectious agents does occur. He differentiates two types of hypersensitiveness, which he designates as "anaphylactic" and "tuberculin" on the basis of the following criteria: Locally, the anaphylactic type gives an

30. Benkwith, K. B.: Allergic Reaction to Scotch Tape, Correspondence, Arch. Ophth. **36**:620 (Nov.) 1946.

31. Grana, P. C.: Conjunctivitis and Dermatitis Due to "Beach Apple": Report of Thirteen Cases, Arch. Ophth. **35**:421-422 (April) 1946.

32. Thygeson, P.: Etiology and Treatment of Blepharitis: Study in Military Personnel, Arch. Ophth. **36**:445-477 (Oct.) 1946.

33. Davidson, M. T.: Bacterial Allergy, a Misnomer, South. M. J. **32**:332-335, 1946.

34. Tuft, L.: Bronchial Asthma: Critical Review, J. Allergy **17**:27-40, 1946.

35. Forman, J.: Bronchial Asthma with Special Reference to Elderly Victims, Geriatrics **1**:80-86, 1946.

36. Scherp, H. W.: Hypersensitivity to Infectious Agents in Relation to Asthma, J. Allergy **17**:255-259, 1946.

immediate reaction with wheal and flare formation and may go on to Arthus' phenomenon; the tuberculin type of reaction is delayed, is of inflammatory character and may lead to a slough. The final stage in the two types may be indistinguishable. The general reaction in the anaphylactic type of hypersensitiveness, again, is acute, whereas in the tuberculin type it is chronically progressive. Circulating antibodies are not a significant feature in the tuberculin type but definitely are in the anaphylactic type.

Zoss, Neidlinger and Read [37] state that in their series of cases chronic sinus infection appeared to be instrumental in producing the onset of asthma and maintaining its activity.

Rosen [38] studied 100 asthmatic patients in an Army general hospital with regard to nasal and paranasal symptoms and findings. Forty-five of this group had no nasal symptoms. The other 55 had nasal symptoms either perennially or seasonally. There was little difference in the appearance of the nasal mucosa of the two groups except in patients with seasonal hay fever. Transillumination of sinuses, roentgenologic studies, blood eosinophil counts and cutaneous tests were more frequently of diagnostic value in the group with nasal symptoms. Rosen [38] found that nasal symptoms accompanying perennial asthma usually appeared at the same time as the asthma but could either precede or follow it by many years.

Zoss, Neidlinger and Read [37] studied 250 asthmatic soldiers bronchoscopically. In 89.6 per cent they found bronchial abnormalities (in 49.2 per cent chronic suppurative bronchitis, 38.8 per cent chronic nonsuppurative bronchitis and 1.6 per cent allergic bronchitis). Fifty per cent of the patients had chronic suppurative sinusitis (leading to the conclusions cited previously). Altogether 73.2 per cent of the entire group had a chronic suppurative infection of the respiratory tract. Such chronic infections, including bronchitis, were found in many patients with relatively early disease (30 with a duration of less than two years). The criteria by which the various bronchial abnormalities were differentiated are presented, and the significance of the observations is discussed.

Lell [39] reports on bronchoscopy in the diagnosis of allergic pulmonary disease. In a group of 176 children with asthmatic symptoms, he found foreign bodies in the respiratory tract in 18 and in the esophagus

37. Zoss, A.; Neidlinger, W. J., and Read, H. S.: Survey of Bronchial Asthma in Soldiers: Bronchoscopic Findings and Incidence of Respiratory Infection, J. Allergy **17**:87-96, 1946.

38. Rosen, F. L.: Bronchial Asthma in the Young Male Adult: Study of One Hundred Hospitalized Patients in Army General Hospital, with Special Reference to Nasal Symptoms and Findings, Ann. Allergy **4**:247-260, 1946.

39. Lell, W. A.: Bronchoscopy as an Aid in the Diagnosis and Treatment of Allergic Pulmonary Disease, Arch. Otolaryng. **43**:49-58 (Jan.) 1946.

in 5. In 14, there was tracheal compression; in 8, organic changes in the larynx, and in 1, a retropharyngeal abscess.

Frank [40] reports a case in which asthma-like symptoms from laryngeal obstruction (due to carcinoma) were relieved when the obstruction was removed. He emphasizes that not all asthma-like attacks are allergic.

Glaser [41] gives a general discussion of conditions observed in asthmatic children. Differential points in the following conditions accompanied with wheezing are discussed. Asthmatic bronchitis (which he feels is always followed by bronchial asthma in children who continue to have pulmonary difficulties), foreign bodies in a bronchus (indications for bronchoscopy), cystic fibrosis of the pancreas (chief points are absence of response to sympathomimetic drugs, absence of eosinophilia, absence of pancreatic enzymes in duodenal drainage), thymic asthma (no response to epinephrine), Ayerza's disease, dust bronchitis (characterized by an explosive cough), sighing dyspnea (no evidence of obstruction), asthmatic cough (differentiated from pertussis by absence of whoop, therapeutic test with epinephrine hydrochloride, eosinophilia and absence of characteristic pertussis blood picture), bronchotetany (made worse by epinephrine and cured by administration of calcium) and cardiac asthma (rare in children.)

Treatment of asthma with antihistamine drugs will be reviewed under that heading.

Barach,[42] Cummings [43] and Lell [39] discuss the treatment of status asthmaticus and intractable asthma. Lell found that on bronchoscopic examination the mucous membrane of the trachea and both main bronchi of most patients in status asthmaticus had a hemorrhagic and edematous appearance. There was usually a thick tenacious secretion. Cumming [43] regarded the metamorphosis of ciliated cells to goblet cells, with consequent production of mucus which advances toward the larger airways, as the most significant pathologic factor in status asthmaticus. Lell,[39] Cummings [43] and Barach [42] therefore regard bronchoscopy with removal of the secretion as an extremely important measure in status asthmaticus. Lell [39] recommends administration of oxygen through the bronchoscope as an aid in relieving dyspnea. Cummings [43] mentions a number of drugs of value in status asthmaticus, including epinephrine hydrochloride, epinephrine in oil suspension or by nebu-

40. Frank, D. E.: Laryngeal Obstruction with Asthmatic Symptoms, Ann. Allergy **4**:40-42, 1946.

41. Glaser, J.: Differential Diagnosis of Bronchial Asthma in Infancy and Childhood, Ann. Allergy **4**:409-424, 1946.

42. Barach, A. L.: Treatment of Intractable Asthma, J. Allergy **17**:352-357, 1946.

43. Cummings, G. O.: Status Asthmaticus, Ann. Otol., Rhin. & Laryng. **55**:136-145, 1946.

lizer, ephedrine and aminophylline to aid in widening the airways. Iodides are recommended to aid in elimination of mucus and a mixture of 80 per cent helium and 20 per cent oxygen to ease the entrance of oxygen into the alveoli. Various methods may be used for resting the patient. Penicillin aerosol may be tried to combat infection.

Barach [42] also reviews and evaluates a number of methods of treatment in intractable asthma. He mentions 40 to 50 per cent oxygen, preferably given through a catheter. Meperidine hydrochloride (demerol hydrochloride®) intramuscularly (two 50 mg. doses rather than a single 100 mg. dose to avoid side effects) is recommended. Eighty per cent helium 20 per cent oxygen mixture (most effective with positive pressure) is suggested, and nebulized epinephrine hydrochloride (1:75 or 1:100) or nebulized phenylephrine hydrochloride (neo-synephrine,® 1 per cent) can be used with it. Aminophylline and ether anesthesia are considered to be of benefit. Use of penicillin is discussed, but no clear results are given. Penicillin therapy for sinusitis in these cases is considered preferable to surgical measures. About half the patients treated with penicillin aerosol by oral inhalation were improved for two months or more. The others had partial or complete recurrence of their symptoms.

Forman [35] reports that in older patients a regimen including an allergen-free room, balanced diet, lemonade (as a source of carbohydrate) and vitamin C, along with small doses of iodides and suppositories of aminophylline when needed, effectively prevents development of status asthmaticus and gives relief from symptoms during treatment with extracts or vaccines. Aminophylline with ephedrine and sodium bromide is recommended by Damrau.[44] Baumann and her associates [45] were able to secure alterations of the bacterial flora in the respiratory tracts of patients with what they called bacterial asthma by the oral use of penicillin (60,000 units every three hours for three days). The asthma seemed to be controlled for short periods.

Fishman [46] claims beneficial results in nasal and bronchial allergies through the use of penicillin sodium in an ordinary atomizer. The method is convenient but is considered only as an adjuvant to proper allergic management.

Southwell [47] gives the results of inhalations of penicillin in 43 patients with bronchiectasis, bronchitis and asthma. The best results

44. Damrau, F.: Therapeutic Study of Bronchial Asthma, M. Rec. **159**:38-40, 1946.

45. Baumann, F.; Crump, J.; Arthurs, A. C., and Seagar, L. D.: Use of Oral Penicillin in Treatment of Bacterial Asthma, J. Allergy **17**:265-269, 1946.

46. Fishman, A. E.: The Common Atomizer as an Efficient Agent for Penicillin, M. Rec. **159**:546-548, 1946.

47. Southwell, N.: Inhaled Penicillin in Bronchial Infections, Lancet **2**:225-227, 1946.

were obtained in the group with short term bronchitis. Of 17 patients with chronic bronchitic asthma, 1 was cured, 13 were improved and 3 were unchanged. In 4 patients with allergic asthma there was no improvement.

Leopold [48] used high doses of penicillin intramuscularly for seven to fourteen days with disappointing results. The signs of bronchitis in chronic bronchial asthma were not completely and permanently cleared in any of 85. In a review of the use of penicillin in otorhinolaryngologic practice, Krauss [49] does not report good results in cases in which there was a history of allergy.

Abramson [50] has used penicillin combined with hydrogen peroxide aerosol in cases of pulmonary infection and states that his results in asthma and asthma complicated with infectious bronchitis and bronchiectasis were inconclusive at the time of the report. In another paper, Abramson [51] reviews the technical methods and procedures involved in aerosol therapy.

Of other methods of treatment of asthma may be mentioned 1-(3,4-dihydroxyphenyl)-2-amino-1-butanol (ethyl-nor-epinephrine®). Hartman [52] has found the drug in 2 per cent solution almost as effective as epinephrine in asthma complicated by bronchial infection. Undesirable local actions on the upper respiratory tract did not occur, and toxic effects were rare and minimal.

Woodward [53] favors active surgical treatment of sinusitis in asthmatic patients, on the ground that even though the operative procedure may not cure the asthma it is still directed at elimination of a condition demanding attention. Tuft,[34] on the other hand, is of the opinion that radical measures do not benefit, and may harm, the asthmatic patient.

ANTIHISTAMINE SUBSTANCES

The recent introduction of a series of new antihistamine substances has led to widespread investigation of these drugs, both experimentally and clinically. Two of the drugs, diphenhydramine hydrochloride and tripelennamine hydrochloride, received the most attention. Experi-

48. Leopold, H. C.: Penicillin Therapy in Chronic Bronchial Asthma, J. Allergy **17**:166-171, 1946.

49. Krauss, F. H.: Penicillin Therapy in Otorhinolaryngologic Practice, Arch. Otolaryng. **44**:647-661 (Dec.) 1946.

50. Abramson, H. A.: Combined Penicillin and Hydrogen Peroxide Aerosol Therapy in Lung Infections, Ann. Allergy **4**:199-206, 1946.

51. Abramson, H. A.: Principles and Practice of Aerosol Therapy of the Lungs and Bronchi, Ann. Allergy **4**:440-456, 1946.

52. Hartman, M. M.: Ethyl-Nor-Epinephrine by Inhalation for Bronchial Asthma: A Comparison with Epinephrine, J. Allergy **17**:106-111, 1946.

53. Woodward, F. D.: Surgical Management of Infectious Asthma, J. Allergy **17**:260-264, 1946.

mental studies of these and other antihistamine have been reported by Mayer,[54] Curry,[55] Wells, Morris and Dragstedt,[56] Arbesman, Koepf and Miller,[57] Koepf, Arbesman and Munafo,[58] Friedlaender and Feinberg [59] and Friedlaender and S. M. and A. R. Feinberg.[60]

Mayer [54] has investigated the actions of several antihistamine substances, tripelennamine hydrochloride, in particular. Studies in vitro have shown that the drug is powerfully antihistaminic. In vivo studies demonstrated that 5 mg. would protect guinea pigs from 60 to 120 lethal doses of histamine parenterally and would protect powerfully against histamine effects by inhalation. The pharmacology of antihistamine substances is discussed. Mayer believes that the fact tripelennamine hydrochloride counteracts histamine "in the same order of magnitude as histamine acts itself" indicates that it has specific antihistamine effects. It is considered that antihistamine substances may occupy an important role in the future investigation of the part played by histamine in various clinical conditions. The previous work of many other investigators in this field is extensively quoted.

Curry [55] has demonstrated the ability of antihistamine substances to protect against the bronchoconstriction produced in asthmatic subjects by parenteral injections of histamine. In a previous paper,[61] he reported on the action of histamine on the respiratory tract of 10 normal human subjects, 10 patients with a history of severe allergic tendencies and 9 patients with varying degrees of bronchitis, emphysema and asthma. His criterion was change in vital capacity. There was no reduction in vital capacity in the first two groups after the intra-

54. Mayer, R. L.: Antihistaminic Substances with Special Reference to Pyribenzamine, J. Allergy **17**:153-165, 1946.

55. Curry, J. J.: Effect of Antihistamine Substances and Other Drugs on Histamine Bronchoconstriction, J. Clin. Investigation **25**:792-799, 1946.

56. Wells, J. A.; Morris, H. C., and Dragstedt, C. A.: Modification of Anaphylaxis by Benadryl, Proc. Soc. Exper. Biol. & Med. **61**:104-106, 1946.

57. Arbesman, C. E.; Koepf, G. F., and Miller, G. E.: Some Antianaphylactic and Antihistaminic Properties of N'Pyridyl, N'Benzyl, Dimethylethylenediamine Monohydrochloride (Pyribenzamine), J. Allergy **17**:203-209, 1946.

58. Koepf, G. F.; Arbesman, C. E., and Munafo, C.: Chronic Toxicity of N'Pyridyl, N'Benzyl Dimethylethylenediamine Monohydrochloride (Pyribenzamine), J. Allergy **17**:271-274, 1946.

59. Friedlaender, S., and Feinberg, S. M.: Histamine Antagonists: The Effect of Oral and Local Use of B-Dimethylaminoethyl Benzhydryl Ether Hydrochloride on the Whealing Due to Histamine Antigen Antibody Reactions and Other Whealing Mechanisms; Therapeutic Results in Allergic Manifestations, J. Allergy **17**:129-141, 1946.

60. Friedlaender, S.; Feinberg, S. M., and Feinberg, A. R.: Histamine Antagonists: Comparison of Benadryl and Pyribenzamine in Histamine and Anaphylactic Shock, Proc. Soc. Exper. Biol. & Med. **62**:65-67, 1946.

61. Curry, J. J.: Action of Histamine on Respiratory Tract in Asthmatic Subjects, J. Clin. Investigation **25**:785-791, 1946.

muscular dose of 0.02 to 0.03 mg. of histamine. In 8 of the 9 subjects in the third group sensitivity of the respiratory tract was demonstrated. The degree of sensitivity varied from subject to subject with the degree of asthma. There was no evidence that systemic reactions to histamine in asthmatic persons differed from those in normal persons.

Curry [55] reports that diphenhydramine hydrochloride administered parenterally conferred rapid protection against both systemic reactions and bronchoconstriction induced by histamine. With tripelennamine hydrochloride (50 mg. orally) slower and more irregular protection was obtained. It was pointed out, however, that no comparison between effects can be drawn from these studies, since the drugs were given by different routes. In 1 subject atropine sulfate protected against bronchoconstriction from nebulized histamine but gave only partial protection against intravenous histamine. Aminophylline (theophylline with ethylenediamine) intravenously, epinephrine hydrochloride intramuscularly and ephedrine sulfate intramuscularly all gave complete protection. With ephedrine, however, the protection developed only after two hours. Curry regards this method as of value in measuring the bronchodilating activity of various preparations.

Wells, Morris and Dragstedt [56] report that they were able to reduce the severity of anaphylactic shock in dogs (induced with horse serum) with intravenous doses of diphenhydramine hydrochloride (10 mg. per kilogram of body weight). None of 22 animals so treated died, whereas 9 of 26 controls died. A similar modifying effect on histamine shock they consider consistent with the theory that histamine plays a significant role in anaphylaxis in the dog. As the vasodepressor effect of histamine was not obliterated by the drug, the authors do not feel justified in concluding that histamine is the only vasodepressor factor.

Arbesman and his associates [57] have studied the antianaphylactic properties of tripelennamine hydrochloride through passive anaphylactic experiments with guinea pigs. They report that the drug had potent antianaphylactic activity and produced no demonstrable effects on the precipitin or complement titer. They further found that in 18 of 26 human subjects oral doses of the drug decreased the size of skin wheals and that in 14 of 24 allergic patients skin reactivity was reduced. Tripelennamine hydrochloride also reduced the reactivity of skin sites passively sensitized with serum containing cottonseed reagins. The same group of workers [58] have also investigated the chronic toxic effects of tripelennamine hydrochloride and report that doses of 50 to 100 mg. daily for a year had no effect on the general behavior of dogs. There was no febrile reaction, no impairment of kidney or liver function and no alteration of hemopoiesis. Three human subjects were given 150 mg. of the drug daily for eighty days without toxic changes being noted.

Friedlaender and Feinberg [59] found that oral doses of diphenhydramine hydrochloride slightly inhibited experimentally produced skin wheals but that local application noticeably reduced the whealing reaction. A similar effect was noted in ragweed wheals in sensitive subjects. The local effect of this drug is contrasted with that of epinephrine, which acts by vasoconstriction. Clinical data presented in this paper are consistent with those reported elsewhere by these authors.

Friedlaender and S. M. and A. R. Feinberg [60] compared the effects of tripelennamine hydrochloride and diphenhydramine hydrochloride. They report that whereas five times the lethal dose of histamine was required to kill guinea pigs protected with diphenhydramine hydrochloride, thirty-five times the lethal dose was required to kill those protected with tripelennamine hydrochloride. No difference in the protective power of the two drugs against anaphylactic shock was demonstrated.

Most of the clinical reports on the use of diphenhydramine hydrochloride were based on a dose of 50 mg. three or four times a day (reduced if side effects made reduction necessary). Following is a summary of some of the clinical results obtained in different conditions by different authors using the drug.

Acute urticaria: 100 per cent relieved (Schwartz and Levin [62]; Todd [60]).

Chronic urticaria: 19 of 26 cured (Bowen [63]); complete relief in 12 of 14 (Eyermann [64]); marked relief (Friedlaender [65]); 100 per cent of children and 60 per cent of adults relieved (Levin [66]); 80 per cent relieved (Schwartz and Levin [62]); 5 of 12 relieved (Stroh [67]); 42 of 43 completely relieved (Todd [68]); 80 per cent completely relieved (Waldbott [69]).

Whealing reactions: 25 of 25 completely relieved (Todd [68]).

---

62. Schwartz, E., and Levin, L.: Benzhydryl Ether Hydrochloride (Benadryl) in the Symptomatic Treatment of Allergy, New York State J. Med. **46**:1233-1235, 1946.

63. Bowen, R.: Benadryl: Its Therapeutic Value in Allergy, Texas State J. Med. **42**:188-191, 1946.

64. Eyermann, C. H.: Clinical Experiences with a New Antihistaminic Drug, J. Allergy **17**:210-216, 1946.

65. Friedlaender, A. S.: Use of Histamine Antagonist, Beta-Dimethylaminethyl Benzhydryl Ether Hydrochloride in Allergic Disease, Am. J. M. Sc. **212**:185-191, 1946.

66. Levin, S. J.: β-Dimenthylaminoethyl Benzhydryl Ether Hydrochloride (Benadryl): Its Use in Allergic Diseases, J. Allergy **17**:145-150, 1946.

67. Stroh, J. E.: Benadryl, Northwest Med. **45**:846-848, 1946.

68. Todd, L. C.: Some Clinical Observations in the Use of Benadryl for the Symptomatic Relief of Allergic Conditions, Ann. Allergy **4**:282-287, 1946.

69. Waldbott, G. L.: Clinical Results with Benadryl, J. Allergy **17**:142-144, 1946.

Angioneurotic edema: 100 per cent effective in 3 of 4 patients (Bowen [63]).

Hay Fever: 60 per cent relieved (Bowen [63]); complete relief in 67 per cent and relief from sneezing in 23 per cent, no benefit in 5 per cent (Eyermann [64]); no benefit (Friedlaender [65]); 75 per cent benefited (Koelsche and co-workers [70]); 60 per cent of children and 58 per cent of adults benefited (Levin [66]); 38 of 60 relieved (Stroh [67]); 51 per cent completely relieved and 23 per cent partially relieved (Waldbott [69]); complete relief in 11 patients (Todd [68]).

Vasomotor rhinitis: 20 per cent relieved (Bowen [63]); 3 of 4 relieved of all symptoms (Eyermann [64]); benefit in 66 per cent of children and 18 per cent of adults (Levin [66]); 4 of 9 relieved (Stroh [67]); 50 per cent relieved (Thacker [71]); complete relief in 31 of 35 (Todd [68]); 43 per cent completely and 31 per cent partially relieved (Waldbott [69]).

Perennial allergic rhinitis: 48.8 per cent relieved (Thacker [71]).

Bronchial asthma: less than 10 per cent benefited (Bowen [63]); mild wheezing relieved in 5 of 16 (Eyermann [64]); no benefit (Friedlaender [65]); 33 per cent benefited (Koelsche and co-workers [70]); 66 per cent of children and 65 per cent of adults relieved (Levin [66]); 40 per cent benefited (Schwartz and Levin [62]); 3 of 16 relieved (Stroh [67]); 4 of 8 improved but none completely relieved (Thacker [63]); complete relief in 4 and partial relief in 10 of 18, relief in 2 of 6 complicated with rhinitis (Todd [68]); 32 per cent with perennial and 30 per cent with seasonal completely relieved and 18 per cent with perennial and 16 per cent with seasonal partially relieved (Waldbott [69]).

Migraine: No improvement (Bowen,[63] Eyermann [64] and Friedlaender [65]); 3 of 8 relieved (Todd [68]).

Allergic headache: 66 per cent of children and 60 per cent of adults relieved (Levin [66]); 2 of 4 relieved (Waldbott [69]).

Atropic eczema: pruritus relieved (Friedlaender [65]); 75 per cent of infants and 50 per cent of children and adults benefited (Levin [66]); 1 complete relief and 1 partial relief out of 6 (Waldbott [69]).

Penicillin reactions: 100 per cent effective in 6 (Bowen [63]).

Contact dermatitis: 66 per cent benefited (Levin [64]).

Primary nasal polyposis: no benefit (Eyermann [66]).

Drug eruption (sulfonamide): 50 per cent benefited (Levin [66]).

Ménière's syndrome: 1 of 2 relieved (Thacker [71]); 1 relieved (Bowen [63]); relief in 2 cases (Todd [68]).

---

70. Koelsche, G. A.; Prickman, L. E., and Carryer, H. M.: The Symptomatic Treatment of Bronchial Asthma and Hay Fever with β-Dimethylaminoethyl Benzhydryl Ether Hydrochloride, J. Allergy **17**:151-152, 1946.

71. Thacker, E. A.: Evaluation of Benadryl as a Therapeutic Agent for Vasomotor and Allergic Rhinitis, Arch. Otolaryng. **43**:597-604 (June) 1946.

Side reactions are reported by Bowen,[63] Koelsche and co-workers,[70] Levin,[66] Schwartz and Levin,[62] Stroh,[67] Thacker,[71] Todd [68] and Waldbott.[69]

The most frequent of the side reactions was drowsiness or sleepiness, which in many instances could be relieved by caffein, amphetamine (benzedrine®) or ephedrine. Reduction of dosage was sufficient in other cases, and only a relatively small proportion of the patients reported on had to discontinue use of the drug because of these effects. Other side effects included dryness of the mouth, dizziness, nervousness, epigastric distress, diarrhea, nausea and weakness and fatigue.

Similar studies involving tripelennamine hydrochloride and other antihistamine substances as well as diphenhydramine hydrochloride are reported by Friedlaender,[72] Arbesman, Koepf and Lenzner,[73] and Epstein.[74]

Friedlaender [72] states that both tripelennamine hydrochloride and diphenhydramine hydrochloride are most effective in urticarial dermatosis and for antipruritic effects. In allergic rhinitis and hay fever they are less dependable, and in asthma they are of questionable value. (A review of the summary of reports on diphenhydramine hydrochloride will essentially substantiate this statement). Side effects limiting dosage are frequent.

Arbesman, Koepf and Lenzner [73] report studies on 495 patients, with a total of 565 allergic manifestations, treated with tripelennamine hydrochloride. They recommend a dose of 100 to 400 mg. daily for adults and of 5 to 200 mg. daily for children. Sneezing, rhinorrhea and occlusion were relieved in 75 per cent of 313 patients with allergic rhinitis. The drug relieved or prevented dyspnea in 48 per cent of 98 patients with bronchial asthma. Pruritus was relieved, and the degree of erythema and wheal formation lessened in 83 per cent of 154 patients with urticaria. Side effects occurred, although they were not serious and only 4.4 per cent of the patients had to discontinue the drug because of them. Drowsiness was the commonest effect (as with diphenhydramine hydrochloride).

Epstein,[74] writing on the same two drugs, found his best results in urticaria (95 per cent in acute and 80 per cent in chronic). His least satisfactory results were in asthma (40 to 50 per cent).

---

72. Friedlaender, S.: Experimental and Clinical Evaluation of Synthetic Anti-Histaminic Drugs, Am. J. Med. **1**:174-179, 1946.

73. Arbesman, C. E.; Koepf, G. F., and Lenzner, A. R.: Clinical Studies with N'Pyridyl, N'Benzyl, Dimethylethylenediamine Monohydrochloride (Pyribenzamine), J. Allergy **17**:275-283, 1946.

74. Epstein, S.: Treatment of Allergic Conditions with Pyribenzamine and Benadryl, Wisconsin M. J. **45**:489-496, 1946.

Feinberg [75] reports on antergan® and neoantergan® as well as tripelennamine hydrochloride and diphenhydramine hydrochloride. His observations are consistent with others listed. Diphenhydramine hydrochloride gave the highest percentage of side effects.

Feinstone, Williams and Rubin [76] have experimented with another anthistamine substance, hetramine® (N,N-dimethyl-N′-benzyl-N′-[α-pyrimidyl] ethylenediamine). They have demonstrated a low toxicity in young rats and an effectiveness in preventing or modifying histamne and anaphylactic shock in guinea pigs. Clinical trials were said to be in progress.

Frank [77] has tried papaverine hydrochloride in the prevention of anaphylactic shock in guinea pigs. He found that it prevented fatal anaphylactic shock but failed to prevent histamine shock; hence he concludes that it is not an effective bronchial dilator.

Most of the authors cited state emphatically that antihistamine drugs are effective for palliation only and that they cannot be expected to replace complete allergic diagnostic studies and methods of treatment.

OTHER DRUGS

Clein [78] has found the ergot preparation dehydroergotamine (D.H.E.45) effective in the treatment of headaches of allergic origin. Allergic migraine headaches were relieved in one to three hours. There was a negligible incidence of toxic and side effects. His series of cases is small and he feels that the preparation is worthy of further investigation.

Immunization with histamine azoprotein has been discussed by Coffin and Kabat,[79] McLaurin [80] and Eder.[81]

---

75. Feinberg, S. M.: Histamine and Antihistaminic Agents: Their Experimental and Therapeutic Status, J. A. M. A. **132**:702-713 (Nov. 23) 1946.

76. Feinstone, W. H.; Williams, R. D., and Rubin, B.: Antihistamine and Antianaphylactic Effect of Hetramine, a New Synthetic Pyrimidine Compound, Proc. Soc. Exper. Biol. & Med. **63**:158-161, 1946.

77. Frank, D. E.: Use of Papaverine Hydrochloride in Prevention of Anaphylactic Shock in Guinea Pigs, J. Immunol. **52**:59-64, 1946.

78. Clein, N. W.: D.H.E.45 (Dihydroergotamine) in Treatment of Allergic Migraine, Ann. Allergy **4**:128-130, 1946.

79. Coffin, G. S., and Kabat, E. A.: Effects of Immunization with Histamine Azoprotein on Histamine Intoxication and Passive Anaphylaxis in Guinea Pig, J. Immunol. **52**:201-206, 1946.

80. McLaurin, J. W.: Desensitization by Histamine (Histamine Azoprotein) in Vertigo, Periodic Headaches and Vasomotor (Allergic) Rhinitis: Review of Literature and Report of One Hundred and Two Personal Cases, Laryngoscope **56**:253-281, 1946.

81. Eder, H. L.: Hexamine in the Treatment of Allergic Rhinitis in Children, Arch. Pediat. **63**:209-215, 1946.

Coffin and Kabat, working with guinea pigs, have not obtained results particularly favorable to this method of treatment. They found that injection of histamine azoprotein confers little or no protection against a minimum lethal dose of histamine injected intravenously. Guinea pigs could be protected against passive anaphylaxis by a series of injections of histamine azoprotein, the protective effect being increased by adjuvants. Immunization with horse serum and adjuvants appeared to protect against passive anaphylaxis to about this same degree as histamine azoprotein. The adjuvants alone gave little protection. Finally, it was demonstrated that histamine azoprotein could sensitize a guinea pig so that fatal anaphylaxis followed an intravenous injection of that substance.

McLaurin,[80] however, reports good clinical results with histamine azoprotein over a sixteen month period (ending in 1945) in 40 cases of vertigo, 9 of periodic headaches (including 1 of histamine cephalalgia) and 41 of vasomotor rhinitis. Other cases in which the same method of treatment was used were not reported because the author felt that they had not been under observation long enough. There were only a few reactions to treatment, and epinephrine was required only occasionally. McLaurin presents a good discussion of the rationale of histamine azoprotein therapy.

Eder [81] reports 17 cases of allergic rhinitis in children treated with histamine azoprotein. He also reported 7 cases of asthma and 3 of atopic dermatitis. Fourteen patients were under 5 years of age. His method of treatment with histamine azoprotein is presented.

EXPERIMENTAL WORK AND LABORATORY FINDINGS

Fidlar and Waters,[82] working with dogs in anaphylactic and peptone shock, report that peptone in doses of 0.3 Gm. per kilogram produced a reaction very similar to anaphylactic shock not only on the blood pressure but on the platelets as well. The platelet count fell to 2.5 to 20 per cent of the original value in two to ten minutes after injection of the antigen. There was always clumping of the platelets, an effect which the administration of heparin did not prevent. The low platelet count was also obtained in anesthetized and liverless dogs. The authors conclude that the platelet count is of value in indicating sensitivity in mild or doubtful cases of canine anaphylaxis.

Graña [83] produced reductions in the concentration of platelets in guinea pigs and dogs with serum of rabbits immune to sheep erythrocytes even with doses provoking only moderate shock or no shock.

---

82. Fidlar, E., and Waters, E. T.: Behavior of Platelets in Anaphylactic and Peptone Shock, J. Immunol. **52**:315-323, 1946.

83. Graña, A.: Blood Platelets in Heterophil Anaphylaxis, Proc. Soc. Exper. Biol. & Med. **61**:192-195, 1946.

He states that the platelets usually disappeared from the blood in deep shock. The experiments, however, indicate that there is not always a parallel relation between the decrease of platelets and the intensity of pulmonary symptoms in the guinea pig or the decrease of blood pressure in the dog.

Quick, Ota and Baronofsky [84] report that the thrombopenia of anaphylactic shock is not prevented by either heparin or splenectomy.

Rocha e Silva and Teixeira [85] believe that peptone produces shock in the dog by a mechanism similar to that producing anaphylactic shock. They found a close connection between the severity of the shock and the incapacity of leukocytes and platelets to return to the circulation from the liver, suggesting that these elements participate in the discharge of histamine and heparin. They have further demonstrated in experiments with isolated liver that peptone alone is unable to release these substances, the retention of leukocytes and platelets being absolutely necessary for this to occur. It is suggested that activated plasma trypsin is the final mediator for the release of histamine and heparin, since platelets contain a kinase for this enzyme. Desensitization occurring in this kind of shock is probably dependent upon the exhaustion of the capacity for activation of plasma trypsin.

Graña [86] has come to a number of similar conclusions. He considers the liver the most important organ in the production of shock in the dog but concludes that other organs must also contribute, since a fall in blood pressure can occur in experimental shock in liverless animals. The liver is chiefly responsible for the liberation of heparin and perhaps also blood histamine, of which the liver loses large amounts during shock. It has been shown, however, that antigen alone would not accomplish the liberation of histamine from a perfused liver.

In the light of these papers it is interesting to note that Waters, Markowitz and Jaques [87] have succeeded in producing typical anaphylactic shock in dogs with an Eck fistula (an anastomosis between the portal vein and the inferior vena cava, bypassing the portal circulation).

A method for estimating leukocyte fragility, which is comparable to that used in determining red cell fragility, has been described by

---

84. Quick, A. J.; Ota, R. K., and Baronofsky, I. D.: Thrombopenia of Anaphylactic and Peptone Shock, Am. J. Physiol. **145**:273-278, 1946.

85. Rocha e Silva, M., and Teixeira, R. M.: Role Played by Leucocytes, Platelets and Plasma Trypsin in Peptone Shock in the Dog, Proc. Soc. Exper. Biol. & Med. **61**:376-382, 1946.

86. Graña, A.: Influence of the Liver in Anaphylactic Shock: Experimental Study, Ann. Allergy **4**:261-267, 1946.

87. Waters, E. T.; Markowitz, J., and Jaques, L. B.: Anaphylactic Shock in Dogs with an Eck Fistula, Am. J. Physiol. **146**:487-489, 1946.

Squier,[88] who believes that increased leukocytic fragility is as important an indicator of allergy as is eosinophilia.

Healy [89] has suggested a blood precipitin test for allergens which he feels will be more convenient both for physicians and patients than extensive skin testing. Kelley [90] working with this method has reported encouraging results.

Parsons [91] considers determinations of sedimentation rate of value in the diagnosis of allergies. In a series of cases he has demonstrated that the rate was normal in uncomplicated allergic disease. On the other hand, increased rates were found in cases complicated by infection; the rates returned to normal when the infection cleared up. A direct test for the blocking antibody (of Cooke) is presented by Maunsell.[92] She has demonstrated a blocking antibody in the serums of specifically treated hay fever patients and states that the blocking titer may serve as a guide to the degree of clinical protection. No blocking antibody could be detected in patients with hay fever treated with serum from nonallergic group A donors.

MISCELLANEOUS ALLERGIES

Harkavy [93] discusses vascular allergies and gives a rather extensive review of the literature on this subject. He takes up the part played in vascular allergy by heredity, nonspecific factors, bacterial toxins, tobacco, foods, physical agents, drugs, immune serums, pollens and a number of other agents. Bacterial allergy is discussed at some length. Harkavy feels that there are two major shock tissues, the heart and the kidneys. The outcome depends on the degree and reversibility of the involvement.

A number of instances of allergic reactions to penicillin have been reported. Those reported by Schultz [28] and Benkwith [29] have been mentioned previously. Two additional cases are described by Truitt.[94] In a study of 10 cases of reactions to penicillin in patients with bacterial allergic dermatitis, Heinlein, Carpenter and Duffy [95] suggest

88. Squier, T. L.: Leucocyte Fragility in Transitory Leucopenia, J. Allergy **17**:197-202, 1946.

89. Healy, J. C.: Evaluation of Allergen Diagnosis, Ann. Otol., Rhin. & Laryng. **55**:871-877, 1946.

90. Kelley, V. J.: Blood Allergy Method (Precipitin Tests) in Otolaryngology, Ann. Otol., Rhin. & Laryng. **55**:878-881, 1946.

91. Parsons, P. J.: Sedimentation Role—a Diagnostic Aid in Allergy, Ann. Allergy **4**:220-222, 1946.

92. Maunsell, K.: Direct Test for Blocking Antibody in Treated Hay Fever, Lancet **2**:199-200, 1946.

93. Harkavy, J.: Vascular Allergy, Clinics **5**:504-549, 1946.

94. Truitt, C. W.: Reactions to Penicillin, Ann. Allergy **4**:196-198, 1946.

95. Heinlein, J. A.; Carpenter, C. C., and Duffy, B. J.: Aggravation of Bacterids by Penicillin, with Theory as to Causation, U. S. Nav. M. Bull. **46**:571-575, 1946.

that the reactions may have been due to toxins liberated from the focus in infection.

Gordon [96] and Strazza [97] report cases of delayed reaction similar to serum sickness. The clinical courses in these cases and others cited by the authors from the literature were strikingly similar. The symptoms in each case were severe, including malaise, intense urticaria, arthralgia and, at times, exfoliative dermatitis. The course seemed to run seven to ten days regardless of treatment. Other reports deal with asthma due to bee scent (Jamieson [98]) and an allergic reaction following vaccination against typhus and yellow fever, presumably due to sensitivity to egg yolk (Rubin [99]). Rubin feels that sensitivity to egg yolk may exist alone, without sensitivity to egg white, and that in persons sensitive to egg or to chicken allergic manifestations may develop from vaccines grown on yolk sacs or on chick embryos. Plotz,[100] however, reports that among the millions receiving such vaccines during the war severe reactions were minimal. He adds, however, that some reactions did occur in persons sensitive to egg; he considers that the risk is probably greater in children than in adults. Concentrated washed rickettsial suspensions are suggested as perhaps safer than the vaccines. Coulson and Stevens [101] have shown that such suspensions contain some egg protein but in much smaller quantity than the typhus vaccines. Stull [102] is convinced that chick embryo and yolk sac vaccines contain enough egg proteins to cause severe reactions in egg-sensitive persons, but he has shown that suspension of rickettsias elicits no cutaneous reactions in persons sensitized with serums from egg-sensitive persons.

---

96. Gordon, E. J.: Delayed Serum Sickness Reaction to Penicillin, J. A. M. A. **131**:727-730 (June 29) 1946.

97. Strazza, J. A., Jr.: Delayed Sensitization to Penicillin Similar to Serum Sickness, J. A. M. A. **130**:1071 (April 20) 1946.

98. Jamieson, H. C.: Asthma Due to Bee Scent, Ann. Allergy **4**:213-215 1946.

99. Rubin, S. S.: An Allergic Reaction Following Typhus-Fever Vaccine and Yellow Fever Vaccine Due to Egg Yolk Sensitivity, J. Allergy **17**:21-23, 1946.

100. Plotz, H.: Allergenic and Anaphylactogenic Properties of Vaccines Prepared from Embryonic Tissues of Developing Chicks: I. Skin-Sensitivity Following the Subcutaneous Innoculation of Typhus-Vaccines in Man, J. Immunol. **53**:315-319, 1946.

101. Coulson, E. J., and Stevens, H.: Allergenic and Anaphylactogenic Properties of Vaccines Prepared from Embryonic Tissues of Developing Chicks: II. Anaphylactogenic Properties of Typhus Fever Vaccines and Equine Encephalomyelitic Vaccines, J. Immunol. **53**:321-342, 1946.

102. Stull, A.: Allergenic and Anaphylactogenic Properties of Vaccines Prepared from Embryonic Tissues of Developing Chicks: III. A Study to Determine Whether Chick Embryo Yolk Sac Vaccines Contain Sufficient Egg Proteins to Cause Severe Systemic Reactions if Given to Egg Sensitive Individuals, J. Immunol. **53**:343-349, 1946.

Swineford [103] sounds a word of warning in intradermal skin testing by citing 2 cases of anaphylactic shock following this procedure (1 of them fatal). The antigen responsible in the fatal case could not be determined. In the other case it was thought to have been due to mustard. A case of fatal anaphylactic shock in identical twins following a second injection of diphtheria anatoxin and pertussis antigen was reported by Werne and Garrow.[104]

Coombs [105] believes that in some cases allergies can be traced to the water supply.

Petersen [106] made some interesting studies on drug sensitivity. He reviewed a series of cases from various parts of the country correlating clinical episodes with changes in temperature and barometric pressure. His conclusion was that such cases are probably not true allergies but reactions in response to environmental change affecting the distribution and concentration of the drug in different tissues. Such factors as acid base balance and relative anoxia are also considered. Reactions to several drugs are included in the report.

On the negative side Grolnick [107] showed that tyrothricin would not sensitize the skin and Brown [108] showed tissue tolerance to a new glycerol peroxide antiseptic solution.

ALLERGY IN THE TROPICS

Blue,[109] Rosen [110] and Winkenwerder [111] point out the frequency with which latent allergies became active in soldiers in the South

---

103. Swineford, O.: Anaphylactic Shock from Skin Testing, J. Allergy **17**:24-26, 1946.

104. Werne, J., and Garrow, I.: Fatal Anaphylactic Shock: Occurrence in Identical Twins Following Second Injection of Diphtheria Toxoid and Pertussis Antigen, J. A. M. A. **131**:730-735 (June 29) 1946.

105. Coombs, G. H.: Allergy and Your Water Supply, J. Maine M. A. **37**:98, 1946.

106. Petersen, W. F.: Drug Sensitivity on a Nonspecific Basis, Ann. Allergy **4**:43-55, 1946.

107. Grolnick, M.: Studies to Determine the Ability of Tyrothricin to Sensitize the Skin, J. Allergy **17**:284-287, 1946.

108. Brown, E. A.: Studies on Tissue Tolerance to a New Glycerol Peroxide Antiseptic Solution, Ann. Allergy **4**:33-39, 1946.

109. Blue, J. A.: Allergy in the Pacific, J. Allergy **17**:97-105, 1946.

110. Rosen, F. L.: Bronchial Asthma in the Young Male Adult: Study of Fifty Patients Returned from the Tropics for Bronchial Asthma as Compared with Fifty Asthmatics Stationed in the United States, Ann. Allergy **4**:391-396, 1946.

111. Winkenwerder, W. L.: Asthma—as Observed Overseas in General Hospital in Southwest Pacific Area—with Special Reference to Relationship of Tropical Service to Onset and Recurrence, Bull. Johns Hopkins Hosp. **78**:78-95, 1946.

Pacific. Blue and Rosen both emphasize the importance of the changeless season, the lush vegetation pollinating the year around and the hot humid climate of the area. Emotional factors are also considered. Rosen further emphasizes such factors as chlorinated water, odors, insects, wood and chemical smokes and dust.

Blue [109] reports that the allergies occurring in the tropics are no different from those found in the continental United States. Of 500 patients in his series, 293 (58.6 per cent) had asthma, 56 (11.2 per cent) hay fever, 38 (7.6 per cent) urticaria, 35 (7 per cent) allergic rhinitis, 16 (32 per cent) angioneurotic edema, 13 (2.6 per cent) migraine, 13 (2.6 per cent) allergic bronchitis, 11 (2.3 per cent) headaches, 6 (1.2 per cent) allergic dermatitis, 4 (0.8 per cent) allergic conjunctivitis, 4 histamine cephalalgia, 4 tropical eosinophilia and 3 (0.6 per cent) physical allergies. It will be noted that three types of headaches (migraine, headaches and histamine cephalalgia) are included in this list. Thirty-five per cent of Blue's patients had initial symptoms in the tropics.

Rosen [110] reviewed the cases of 100 patients with asthma (50 who had returned from the tropics and 50 who had never left the United States) and reports that 40 per cent of the overseas group had their initial attack while out of the country, whereas only 14 per cent of the others had their first attack after induction.

Similar observations, also on asthmatic patients, led Winkenwerder [111] to state that a history of asthma or hay fever should limit a man's overseas duty and preclude his being sent to the tropics.

HEREDITY IN ALLERGY

The hereditary factor in respiratory allergies was investigated by Stiles and Johnston,[112] who studied a family of 232 persons covering five generations. The incidence of respiratory allergies in the family was 22.4 per cent, as compared with 7 per cent in the general population. The authors feel that perfect mendelian ratios cannot be expected because of the complexity of both the environmental and the hereditary factors involved. Their data, they believe, indicate that respiratory allergy is inherited as an irregular mendelian dominant, the gene exhibiting low penetrance with variable expressitivity. The actual appearance of symptoms may depend on various factors, such as presence of the atopen, climate, age and sex. It is the predisposition to become hypersensitive rather than the specific sensitivity that seems to be inherited.

---

112. Stiles, K. A., and Johnston, E. J.: Inheritance of Respiratory Allergies, J. Allergy **17**:11-19, 1946.

CASE HISTORY IN ALLERGY; ANAPHYLAXIS AND ALLERGY

Millman [113] emphasizes the need for careful diagnosis in routine cases of respiratory allergy. A plea is made for a careful evaluation of the patient and the findings as a whole. The history is of particular importance with the necessity for bringing out the following points: Initial onset, seasonal incidence, freedom between attacks, aggravating factors, effect of climate and geographic location, time of day when attacks are worse, duration of attacks, family history, occupation of members of family, diet, supposed cause, sources of relief and miscellaneous questions.

Burrage [114] considers the history the most important of all diagnostic methods in determination of causative factors in allergy. Skin tests, he feels, are of value in corroborating findings but can often be misleading and difficult to interpret. Gutman [115] illustrated the importance of the history with a review of 6 cases of urticaria, eczema and allergic rhinitis. Schwartz [116] submitted a method for keeping chronologic records of allergic children in pediatric practice.

An extensive review of allergy in general practice has been published in *Clinics*. Some of the articles in that review are specifically quoted in this paper. In another section of the same periodical, Horesh [117] reviews the problem of allergy in children.

Finally, Rackeman [118] raises a number of interesting questions for the future of allergy, with special reference to the asthmatic state, hay fever and asthma.

---

113. Millman, M.: The Diagnosis of Respiratory Allergy, Virginia M. Monthly **73**:309-314, 1946.

114. Burrage, W. S.: Common Sense in Allergy, M. Clin. North America **30**:1131-1137, 1946.

115. Gutman, M. J.: Importance of Case History in Allergy, M. Rec. **159**:669-672, 1946.

116. Schwartz, A. B.: The Importance of Chronologic Records in the Management of Allergic Children, J. Pediat. **29**:474-476, 1946.

117. Horesh, A. J.: Allergy in Children, Clinics **5**:678-697, 1946.

118. Rackeman, F. M.: Future Problems in Allergy, South. M. J. **39**:497-501, 1946.

PERORAL ENDOSCOPY

Review of the Literature for 1947

LOUIS H. CLERF, M.D.

F. JOHNSON PUTNEY, M.D.

AND

J. J. O'KEEFE, M.D.

PHILADELPHIA

ANESTHESIA IN ENDOSCOPY

METHODS of anesthesia vary with different operators and usually are influenced by a number of factors. The agents that are available now give one ample choice, although they are not equally safe.

Titche's [1] observations with tetracaine hydrochloride (pontocaine hydrochloride®) led him to believe that it is an excellent drug for anesthesia for the upper respiratory passages if used properly. A study of the literature revealed a number of untoward reactions to tetracaine, but in many of these it appeared that excessive amounts, varying from 5 to 10 cc. of a 2 per cent solution, were used. In addition, there was a definite sensitivity to tetracaine.

Procedure consists of administering pentobarbital sodium, 1½ grains (0.1 Gm.), one-half hour prior to bronchography. The prebronchoscopic medication consists of pentobarbital sodium, 1½ grains, given one hour before the examination and dihydromorphinone hydrochloride (dilaudid hydrochloride®), 1/30 grain (0.002 Gm.), with scopolamine hydrobromide, 1/200 grain (0.00037 Gm.), one-half hour before.

Anesthesia with tetracaine is the same in both instances. The pharynx is sprayed twice with tetracaine, 2 per cent, containing one drop of epinephrine 1:1,000 to each cubic centimeter, using an average of 1.5 cc. For laryngeal and tracheal anesthesia, a 0.5 per cent solution of tetracaine hydrochloride, also containing 1 drop of epinephrine hydrochloride (1:1,000) to each cubic centimeter, is instilled with a syringe and cannula in 1 cc. amounts at intervals of two or three minutes for four doses. This produces adequate anesthesia to abolish the cough reflex for a sufficiently long time to permit endobronchial procedures.

In Titche's opinion, the poor results previously reported have been due to use of too large a quantity of the drug. The addition of epi-

1. Titche, L. L.: Anesthesia in Tracheo-Bronchial Procedures, Dis. of Chest **13**:452 (Sept.-Oct.) 1947.

nephrine to the solution also is advocated because it is believed this slows the rate of absorption of the drug and thereby allows detoxification to take place in the liver.

There still appears to be some question regarding the safety of curare when used in conjunction with local anesthesia for endoscopic procedures. Lorhan and Roberts [2] report their experience in the use of intocostrin®–pentothal sodium® anesthesia in 27 cases of laryngoscopy and bronchoscopy. They secured good relaxation in a majority of the patients, allowing the bronchologist to work under ideal conditions. Respiratory depression was encountered in only 2 of the 27. In 1 it was of a severe nature, but the patient recovered after administration of neostigmine methylsulfate. They emphasized that the procedure should not be attempted unless the anesthesiologist is prepared to combat respiratory depression and institute artificial respiration immediately by means of a gas machine.

Endotracheal Intubation.—In patients whose pulmonary protective functions are depressed there soon results an accumulation of tracheobronchial secretions in the air passages which, unless removed, may result in fatal bronchopulmonary infection and death. Foregger [3] emphasizes the importance of having available one or more methods by which these can be removed and refers to four—namely, the single catheter method by which endotracheal aspiration is accomplished by the use of a rubber urethral catheter, suction with a small catheter through a wide bore endotracheal tube, suction through a bronchoscope and suction through a tracheal cannula. He emphasizes the importance of endotracheal intubation and demonstrates in a group of cases that the human larynx will withstand an indwelling catheter for as long as forty-eight hours without permanent harmful results.

Postoperative Pulmonary Complications.—Harwood [4] states the belief that most postoperative pulmonary complications will clear up under simple conservative methods of treatment, and the anesthesiologist can prevent this complication in many instances. Some postoperative atelectases will not resolve without bronchoscopic aspiration, and when this method is employed it must be used early; one aspiration is usually sufficient. If the atelectasis is allowed to continue, the subsequent pneumonia may lead to pulmonary abscess or bronchiectasis. The author points out that in some cases atelectasis is due to a foreign body or tumor which was unrecognized prior to operation.

---

2. Lorhan, P. H., and Roberts, S.: "Intocostrin"–Pentothal Sodium Anesthesia for Bronchoscopy and Laryngoscopy, Arch. Otolaryng. **46**:789 (Dec.) 1947.

3. Foregger, R.: Endotracheal Intubation, J. A. M. A. **133**:1200 (April 19) 1947.

4. Harwood, H. B.: Bronchoscopy in Postoperative Pulmonary Complications, Australian & New Zealand J. Surg. **16**:206 (Jan.) 1947.

Atelectasis following tonsillectomy performed under local anesthesia is a rare complication. In a review of the literature, Sawyer [5] found 3 cases and reported a personal case in which this complication occurred. The atelectasis, which involved the entire right lung, was discovered twenty-four hours following an operation under local anesthesia which was preceded by more than the average preoperative sedation. The patient also was very apprehensive postoperatively and suppressed cough. After discovery of the atelectasis, bronchoscopy was performed and bloody mucus and secretion were aspirated from the right bronchus. The left main bronchus appeared normal. Complete and prompt recovery followed the bronchoscopic removal of the obstructing secretion. Sawyer expresses the opinion that the patient very probably aspirated some blood, which, in combination with her excessive mucus secretion, was responsible for the obstruction.

Postintubation Complications.—With increasing use of endotracheal tubes in anesthesia, it is of interest to observe an occasional report of polyp or granuloma occurring in the larynx, probably the result of trauma. In the case reported by Tuft and Ratner,[6] a total gastrectomy was performed and anesthesia was carried out through a Magill endotracheal tube. The patient was under the anesthetic for three and one-fourth hours. Approximately eight weeks later she complained of hoarseness, which, although present since the gastrectomy, had only recently increased in severity, and she became practically aphonic. A large pedunculated granulomatous mass was found attached to the vocal process of each cord, almost completely occluding the posterior half of the larynx. Direct laryngoscopic removal was carried out. The histopathologic study demonstrated granulation tissue which had undergone organization.

Barton [7] reports 2 cases of granuloma of the larynx which, he believes, was secondary to the passage of an endotracheal tube for inhalation anesthesia. The type of endotracheal tube employed was not indicated. In both cases the lesion, which proved to be acutely inflamed granulation tissue, was unilateral, springing from the right vocal cord in close relation to the vocal process. Barton emphasizes the importance of examining the larynx after endotracheal anesthesia and if abrasions are seen placing the patient on a regimen of vocal rest and carrying out approximate treatment, together with periodic examinations until the lesion is healed.

---

5. Sawyer, L. L.: Massive Atelectasis Following Tonsillectomy Under Local Anesthesia: Report of a Case, Arch. Otolaryng. **46**:45 (July) 1947.

6. Tuft, H. S., and Ratner, S. H.: Laryngeal Polypoid Granuloma Following Intratracheal Anesthesia, Ann. Otol., Rhin. & Laryng. **56**:187 (March) 1947.

7. Barton, L. W.: Granuloma of the Larynx: A Late Complication of Endotracheal Anesthesia, Ann. Otol., Rhin. & Laryng. **56**:191 (March) 1947.

Aplasia of Lung.—A case of congenital aplasia of the lung with a rudimentary left bronchus and absence of lung parenchyma observed in a 40 year old woman is reported by Nesbit and his associates.[8] The patient had no symptoms until six weeks prior to her admission to the hospital, when fever, weakness and dyspnea developed. On bronchoscopic examination the left bronchus and carina were not visualized. After instillation of iodized oil U.S.P. a rudimentary left main bronchus ending blindly 2.5 cm. from the trachea was seen on the roentgenogram.

Bronchoscopy in Diagnosis.—Holinger and Andrews[9] review the significant changes in the management of pulmonary disease. In pulmonary suppuration or acute pneumonic processes, penicillin administered intramuscularly and by inhalation has aided recovery. Before penicillin therapy is instituted, accurate diagnosis of the origin of the suppuration should be made to prevent delay in recognizing a bronchogenic carcinoma or other bronchial obstruction responsible for the suppuration process. Bronchoscopy aids in locating such etiologic factors, in the removal of tissue for biopsy in neoplastic disease and in establishing and maintaining drainage in suppurative conditions.

Vinson[10] discusses bronchial obstruction and emphasizes that this constitutes the most frequent indication for bronchoscopic investigation of the tracheobronchial tree. Stridor or wheezing respiration is the most frequent and significant symptom of partial bronchial obstruction. A number of the organic causes which produce narrowing of the lumen of the trachea or bronchi are discussed. Spasmodic bronchial narrowing produces symptoms which may be confused with those caused by organic disease. Indications for bronchoscopic examination and the differential diagnosis and treatment of these conditions are discussed.

Rupture of Bronchus.—Rupture of a bronchus due to trauma occurs very rarely and is recognized clinically with even greater infrequency. In a study of the literature covering this subject, Kinsella and Johnsrud[11] found reports of 38 cases. In a great many of these the condition was fatal immediately or within a relatively short time after the accident and was usually unrecognized as bronchial rupture until postmortem examination revealed the true condition. A smaller number of patients

---

8. Nesbit, W. M.; Paul, L. W., and Middleton, W. S.: Congenital Aplasia of Lung: Case Report, Am. J. Roentgenol. **57**:446 (April) 1947.

9. Holinger, P. H., and Andrews, A. J., Jr.: Bronchoscopy as Aid in Diagnosis of Pulmonary Disease, Illinois M. J. **91**:12 (Jan.) 1947.

10. Vinson, P. P.: The Role of Bronchoscopy in Bronchial Obstruction, with Special Reference to Spasmodic Bronchial Narrowing, Ann. Otol., Rhin. & Laryng. **56**:1059 (Dec.) 1947.

11. Kinsella, T. J., and Johnsrud, L. W.: Traumatic Rupture of the Bronchus, J. Thoracic Surg. **16**:571 (Oct.) 1947.

recovered spontaneously with the exact nature of the condition unrecognized for months, or even years, following the injury. In a few cases the correct diagnosis was made early, and the patients survived the accident. The authors report 2 personal cases, in both of which the patients recovered. In 1 the condition was not recognized at the time of the accident, and its true nature was ascertained only when a bronchoscopy was done to determine the cause of an atelectasis of the right lung.

In the second case a crushing injury of the chest was followed by marked subcutaneous emphysema and a right-sided pneumothorax. Very active therapy, including aspiration of air from the pleural space and later bronchoscopy, resulted in complete recovery, but the right bronchus ultimately was completely obliterated by a fibrous stricture. The patient appears to be growing normally and there is no evidence of scoliosis. The right lung apparently is totally atelectatic, and the heart is entirely in the right side of the chest.

In reporting 4 cases of intrabronchial hemorrhage in battle casualties, Williams [12] states that he found tracheobronchial aspiration an essential part of the resuscitative treatment and in some cases the only definite treatment necessary. He never observed increased intrabronchial bleeding following bronchoscopic aspiration, and repeated bronchoscopies were tolerated without ill effect.

Eosinophilic Lung.—Font [13] uses the term "eosinophilic lung" to designate a pseudotuberculous condition associated with a high eosinophil count, better known as Loeffler's syndrome or tropical eosinophilia. He reports 2 cases. The bronchoscopic findings were of interest. In 1 case there was found a considerable quantity of frothy secretion with whitish patches of exudate scattered throughout the bronchial mucosa, particularly in the region of the carina and the orifices of the main bronchi. Cultures of the aspirated material yielded pure streptococci of the viridans group in pure culture. Arsenical treatment was instituted, and carbarsone was given in daily doses of 0.25 Gm. for ten days. During this period there was an increase in eosinophils from 53 to 63 per cent. Bilateral antrotomy was performed. Three days later the blood count dropped from 20,000 to slightly more than 13,000, and the eosinophil count was 14 per cent. On the following day the white blood cell count showed a further drop to 9,850. While there was practically no change in the appearance of the lung fields, the bronchoscopic findings were normal at subsequent examinations. In the second

12. Williams, M. H.: Intrabronchial Hemorrhage in Battle Casualties, J. Thoracic Surg. **16**:342 (Aug.) 1947.

13. Font, J. H.: The Eosinophilic Lung, Ann. Otol., Rhin. & Laryng. **56**:804 (Sept.) 1947.

case bronchoscopy revealed a hemorrhagic, red, edematous mucosa with diminution of the lumen of the trachea and both main bronchi. Many eosinophils were found in the bronchial secretions. There was roentgen evidence of maxillary sinus disease and an antrotomy was performed. Penicillin was given preoperatively and postoperatively. The leukocyte count dropped, but eosinophils remained at 16 per cent. After a course of therapy with autogenous vaccine derived from bronchial and antral secretions, improvement continued.

It is Font's opinion that, while no definite etiologic factor could be discovered, the definite relationship in the response of the pulmonary lesions and the eosinophil count emphasizes the possibility that the organisms found at bronchoscopy might be the cause of the condition. He therefore emphasizes the need for diligent search for foci of infection in the oral cavity, the nasopharynx and the accessory sinuses and the importance of bronchoscopy to clarify this interesting syndrome.

Bronchopulmonary Actinomycosis.—The finding of actinomyces in cases of chronic pulmonary suppuration has brought up the question whether these are true cases of actinomycosis. Kay [14] found in careful examination of 240 patients treated over a six month period that 109 of these had Actinomyces israeli in sputum specimens; in 65 of these patients the organisms also were isolated from bronchial secretions obtained bronchoscopically. In approximately 50 per cent of the patients treated who had bronchiectasis, aspiration pneumonia, pulmonary abscess and pulmonary suppuration, actinomyces were isolated in addition to other organisms. Kay feels that the presence of this organism is much less a factor in the determination of the clinical course, chronicity and prognosis of such infections than the mechanical factors of bronchial occlusion or drainage, tissue destruction, fibrosis and avascularity. Patients with chronic bronchopulmonary infection in which these mechanical factors were present were just as resistant to conservative therapy as were those in whom the condition was complicated by actinomyces.

Scleroma.—In a report of 7 cases of scleroma occurring in one family, Hara and his associates [15] discuss the clinical and pathologic aspects and the therapy attempted. Roentgen therapy, which has been reported as beneficial by some writers, was ineffective in 2 cases. Sulfanilamide and sulfadiazine also failed. Streptomycin in adequate doses appeared to be the only drug that gave any relief. The authors used daily aerosol inhalations of 0.5 Gm. of streptomycin and also

14. Kay, E. B.: Bronchopulmonary Actinomycosis, Ann. Int. Med. **26**:581 (April) 1947.

15. Hara, H. J.; Pratt, O. B.; Levine, M. G., and Hoyt, R. E.: Scleroma: A Clinico-Pathological Study of Seven Cases in One Family, Ann. Otol., Rhin. & Laryng. **56**:769 (Sept.) 1947.

gave 2 Gm. intramuscularly in six divided doses. In 1 case, organisms could not be isolated from the throat after the sixth day of treatment, but in another 10 Gm. of the drug significantly reduced the number of organisms but did not entirely eradicate them. The authors are agreed that the time element is important in the permanent cure of such disorders and it is much too soon to attempt to determine the final outcome under this plan of therapy. The remaining members of the family have not been treated, but streptomycin therapy is contemplated.

Mustard Gas Bronchitis.—Although the toxic effects of mustard vapor on the respiratory tract have been known since World War I, it is not generally recognized that many persons employed in the handling of mustard gas and exposed to small quantities of the vapor over a prolonged period may sustain damage to the respiratory mucosa which may leave them partially or totally disabled. Morgenstern and his associates [16] had an opportunity to observe over 200 patients who were treated for both the acute symptoms and the residual effects of exposure to mustard gas in the medical department of an industrial plant.

Although the inflammatory change is severest in the respiratory passage, decreasing in intensity downward, it is in the smaller bronchi and bronchioles that residual pathologic changes due to the accumulation of secondarily infected secretions and necrotic tissues tend to develop. The peribronchial thickening often noted on roentgenograms in the basal portions of the pulmonary field may well represent small areas of patchy atelectasis. This often terminates in bronchiectasis; in fact, 55 of 85 patients on whom bronchographic studies were made showed definite evidence of bronchiectasis, ranging from minimal involvement of a few bronchi in one lobe to extensive involvement of as many as four lobes. Roentgen studies, as a rule, however, are of little value unless definite bronchiectasis can be demonstrated by bronchography. The outstanding and most disabling symptom is persistence of paroxysmal cough on moderate exertion.

Treatment consists of postural drainage, high fluid intake and large doses of ammonium chloride. Patients should be removed from any contact with smoke fumes or dust. Nebulized penicillin now is under therapeutic trial.

Respiratory Complications of Poliomyelitis.—The problems of bronchopulmonary drainage due to accumulation of secretions in the larger air passages and the immediate and remote effects of their removal have been of great interest to the clinician as well as the bronchologist.

16. Morgenstern, P.; Koss, F. R., and Alexander, W. W.: Residual Mustard Gas Bronchitis: Effects of Prolonged Exposure to Low Concentrations of Mustard Gas, Ann. Int. Med. **26**:27 (Jan.) 1947.

The satisfactory results of management based on the thesis that the problem of severe bulbar poliomyelitis is largely one of obstruction of the respiratory tract by secretions with secondary anoxia, with a rapid change in apparently hopeless cases on clearing the airways, suggested to Galloway [17] that anoxia is more important than the virus infection itself. Respiratory complications have been described as of three types; first, those due to spinal paralysis involving the diaphragm or intercostal muscles or both; second, those due to bulbar paralysis involving the mechanism of deglutition, and, third, those due to disturbances of the respiratory center.

Since anoxia due to accumulated secretions is a most important factor in bulbar poliomyelitis, early and adequate care, administration of oxygen, postural drainage and aspiration often are all that is required for recovery. With increasing signs of anoxia, further intervention must be weighed. Galloway believes that indications for tracheotomy in poliomyelitis should be definitely set up in order successfully to combat the increasing difficulties, and he has suggested the following indications:

1. Secretions in the upper airway, with signs of anoxia increasing in spite of administration of oxygen, postural drainage and aspiration. Restlessness, dyspnea, cyanosis, disorientation and mental depression are important determinants.

2. Unconsciousness or marked restlessness in a patient not previously treated and not responding to other treatment in a few minutes.

3. Marked restlessness or stupor in a patient in a respirator, even if he apparently has a spinal type of poliomyelitis.

4. Accumulation of secretions not otherwise easily taken care of in a patient requiring the respirator.

5. Rapidly progressive bulbar symptoms as recommended by the Minneapolis group. Most of the patients in their group had had an onset with severe vomiting.

6. Bilateral paralysis or spasm of the vocal cords.

7. Markedly increasing signs of vasomotor failure not explained as due to a cause other than anoxia.

8. Untrained or inefficient attendants, inadequate equipment or poor cooperation of the patient, with doubt that the airway will be kept constantly free of secretions.

While these present the point of view of the laryngologist and he may play a minor part in the therapeutic team caring for patients with poliomyelitis, he must be prepared to share this part of the responsibility. He should therefore be allowed to see the patient early and his special experience should be used to assess properly the obstructive and anoxic factors, so that he may intervene if necessary before serious damage has been done.

17. Galloway, T. C.: Management of Respiratory Complications of Poliomyelitis, Arch. Otolaryng. **46**:125 (Aug.) 1947.

Tuberculous Tracheobronchitis.—Tuberculous tracheobronchitis has become recognized as a frequent complication of pulmonary tuberculosis which often interferes with respiratory function, leads to spread of the disease and precludes application of collapse therapy otherwise indicated. While in many of these cases the condition may eventually heal by resolution or by scarring, which, in turn, may lead to fibrous stenosis with additional complications, the usual course is slow and fraught with many dangers.

Use of streptomycin in the treatment of pulmonary tuberculosis immediately directed attention to its use in the treatment of tracheobronchial lesions which are readily accessible to bronchoscopic visualization. Brewer and Bogen [18] collected a group of 44 patients with various types of tuberculous tracheobronchitis and instituted a plan of therapy to determine the effects of streptomycin given intramuscularly, by aerosol inhalation and by a combination of the two methods. Thirteen patients given combined intramuscular and aerosol inhalation treatment and 13 given larger doses of streptomycin intramuscularly all showed rapid and complete healing. Less rapid and less uniform results were obtained in 12 patients who received smaller doses intramuscularly and in 12 who were treated by aerosol alone.

This study, although only a preliminary report, indicates that streptomycin is a valuable therapeutic aid in treatment of the severest types of active tuberculous tracheobronchitis—in fact, the most effective that the authors have ever seen.

Judd [19] recorded his findings in a study of 500 consecutive cases of known tuberculous patients and reports that there was some form of mucosal reaction in the majority examined, irrespective of age. The occurrence of an ulcerating process in either the trachea or a bronchus always injects a serious problem in the management of any tuberculous patient. Often contemplated collapse therapy must be postponed, and such postponement may easily extend beyond the optimum time or possibly beyond the time when any procedure can be wisely instituted. If stenotic changes are present, not only may collapse therapy that would otherwise be of real benefit be nullified but the patient may actually be made worse.

Observations made during the study of Judd's cases demonstrated conclusively that endoscopic methods can accomplish a great deal to relieve and at times to cure this type of lesion. Silver nitrate solution ranging from 5 to 30 per cent was considered the cauterizing agent of choice, but not every patient will tolerate this plan of therapy. In

18. Brewer, L. A., and Bogen, E.: Tuberculous Tracheobronchitis, Am. Rev. Tuberc. **56**:408 (Nov.) 1947.

19. Judd, A. R.: Tuberculous Tracheobronchitis: A Study of Five Hundred Consecutive Cases, J. Thoracic Surg. **16**:512 (Oct.) 1947.

these the actual cautery may be cautiously employed; if this is not available, fairly satisfactory results can be obtained by aspirating secretions, removing granulations with a gauze applicator and applying a bland soothing oil. In the presence of a stenotic lesion the only desirable procedure is surgical removal of a lobe or lung. Bronchoscopic treatment and dilations usually are not of benefiit. The principal hope of endoscopy in tuberculous patients is the discovery of pathologic conditions during their earlier stages and, through judicious and timely applications of endoscopic methods of therapy, reduction of morbidity and mortality rates.

The occurrence of rupture of tuberculous lymph nodes into a bronchus apparently is not rare. In the course of two years, Görgényi-Göttche and Kassay [20] observed bronchial rupture, by bronchoscopy in 18 children and by autopsy in 8 children. At autopsy of tuberculous children, with use of a specially careful technic, bronchial rupture was found in 47.1 per cent. There was double bronchial rupture in 17.6 per cent of the children; 52.6 per cent of bronchial ruptures were proved by bronchoscopy. Many ruptures occur in smaller bronchi which cannot be reached with the bronchoscope. Bronchial rupture takes place four to six months after manifestation of primary tuberculous infection. Bronchoscopy is an important procedure for both diagnosis and therapy and cannot be spared in pediatric practice.

Broncholithiasis.—Although the total number of cases of broncholithiasis reported is not great, the number is sufficient to warrant a consideration of this condition in any case of obscure bronchopulmonary disease. In a report of 6 cases, Lell [21] emphasizes that broncholithiasis may produce changes which may simulate any form of pulmonary disease. Hemoptysis is a common symptom, and when it is associated with severe paroxysms of cough and pain as well as expectoration of small calcareous particles one should immediately suspect broncholithiasis.

A routine roentgen study of the chest often will not demonstrate the presence of calcific shadows, and it may be necessary to resort to other refinements in roentgenographic technic. In the presence of a negative roentgen report, bronchoscopic examination still should be made a routine procedure in the presence of unexplained symptoms. In this way many of the cases of broncholithiasis may be discovered early before extensive pathologic changes have occurred.

---

20. Görgényi-Göttche, O., and Kassay, D.: Importance of Bronchial Rupture in Tuberculosis of Endothoracic Lymph Nodes, Am. J. Dis. Child. **74**:166 (Aug.) 1947.

21. Lell, W. A.: Broncholithiasis: Report of Six Cases, Ann. Otol., Rhin. & Laryng. **56**:1064 (Dec.) 1947.

Laryngotracheobronchitis.—Morgan and Wishart [22] studied a series of 549 cases of acute laryngotracheobronchitis and found that there has been a steady increase in the number of patients hospitalized for the condition. The seriousness of the individual case was in inverse proportion to the number of patients admitted in any year. The authors are of the opinion that many of these infections are primarily due to virus. These are recognized by the lack of response to the antibiotics, failure to demonstrate pathogenic bacteria in the cultures, normal leukocyte count or leukopenia and a fairly typical clinical course. Pseudomembranous inflammation was most commonly found in staphylococcic infection and denudation of the mucosa in Staphylococcus aureus and hemolytic streptococcus infections. It was seldom observed in virus infections.

Every patient with laryngitis admitted was given so-called expectant treatment, which consisted, first, of placing the child in an atmosphere saturated with moisture; second, of administering sulfadiazine in doses ranging from 1½ to 4 grains per pound (0.1 to 0.25 Gm. per 0.45 Kg.) of body weight, depending upon the severity of the symptoms or penicillin, 100,000 to 200,000 Oxford units a day or a combination of the two antibiotics; third, sedating the child with one of the barbiturates, preferably pentobarbital sodium because of its rapid reaction (derivatives of opium are contraindicated since they tend to dry up secretions); fourth, culturing the sputum "by Auger suction"; fifth, making a leukocyte count, and sixth, removing mucus plugs from the lower pharynx by gentle suction through a nasal catheter.

The administration of hypertonic human plasma did not prove of value. Oxygen is of help in combating cyanosis but must be used sparingly because it reduces secretions from the mucous membrane.

If there is no amelioration of symptoms within a reasonable time, it is logical to assume that the obstruction of the airway is due to causes other than muscle spasm, and if there is marked dyspnea operative intervention may become a possibility. Laryngoscopic examination will reveal whether there is laryngeal obstruction, for it will demonstrate an adequate airway through the larynx and the obstruction, if tracheal or bronchial; bronchoscopy may be done, but it is the authors' impression that tracheotomy is to be preferred and that suction through the tracheal cannula be carried out. If this is not adequate, bronchoscopic suction can still be performed to remove obstructing masses of secretion. The postoperative management is the most precarious phase of the treatment and requires experienced nurses and

22. Morgan, E. A., and Wishart, D. E. S.: Laryngo-Tracheo-Bronchitis (A Statistical Review of Five Hundred and Forty-Nine Cases), Canad. M. A. J. **56**:8 (Jan.) 1947.

the constant attendance of a bronchologist. If one can control serious complications by chemotherapy and severe toxemia by early diagnosis, the only serious condition with which one has to contend is mechanical obstruction; with ideal facilities this can be corrected in a large proportion of cases.

Bronchography.—The early workers in the field of bronchography were concerned with the introduction into the tracheobronchial tree of radiopaque substances to aid in the diagnosis of the more important lesions. It is only since the perfection of thoracic surgical technic that the need for a complete study of all bronchopulmonary segments has become apparent. Schmidt [23] emphasizes this point, particularly if surgical treatment is contemplated, so all the involved bronchi may be removed at the time of operation and the patient relieved of his symptoms. His report is based on a series of bronchographic studies carried out on military personnel in a military hospital. It was a rule that all bronchopulmonary segments had to be completely filled before the bronchographic studies were finished. In most of the cases a single study was made because the technic was one by which bilateral bronchographic studies were performed as one procedure. Of the 555 bronchographic studies, 257 revealed positive findings. Of these, 158 revealed evidence of nontuberculous bronchiectasis varying from minimal to extensive involvement. It was of interest to note the relative frequency of involvement of the upper lobe. Other positive findings including congenital anomalies of the bronchial tree, cystic lesions of the lung and abscesses of various portions, discovered in the routine study.

Bronchography in Children.—The conquest of bronchiectasis by the surgeon has made bronchography a procedure of major importance. While this can be carried out in the adult patient without difficulty, in the child there are problems that are extremely difficult to overcome. It is obvious that a satisfactory bronchographic study is imperative if the thoracic surgeon wishes to remove all the bronchiectatic segments of the lung. Unless this is done, cure cannot be effected.

Wishart's [24] contributions on bronchography in children have been outstanding, and he advocates use of general anesthesia. This is best performed by carrying out the entire procedure on the fluoroscopic table in the roentgen department. The bronchography is not preceded by sedation. It is performed with the patient under general anesthesia

23. Schmidt, H. W.: Bronchographic Study of Five Hundred and Fifty-Five Cases with Special Reference to Bronchiectasis, Ann. Otol., Rhin. & Laryng. **56**:793 (Sept.) 1947.

24. Wishart, D. E. S.: Bronchography in Children, Ann. Otol., Rhin. & Laryng. **56**:404 (June) 1947.

and is followed by suction, aspiration of the bronchial tree through a bronchoscope, insertion of a special intubation tube, insertion of a small catheter into the bronchial tree, injections of iodized oil and making of appropriate films. Cough during the induction of anesthesia is encouraged, since this aids in getting rid of purulent secretions. Suction through the bronchoscope is carried out to clear the trachea and the main bronchi. Anesthesia is diminished during this procedure in order that deeper respiration and cough may favor the expulsion of exudate from the inaccessible parts of the bronchial tree.

The success of the procedure depends, in part, on a rapid return of the cough reflex once the anesthetic has been started. No ill effects have resulted, and the children invariably make a satisfactory recovery after the procedure. In 1942 Wishart reported that general anesthesia in bronchoscopic work had been used 1,268 times. Since then, it has been employed in hundreds of cases for this purpose, with excellent results.

PULMONARY SUPPURATION

Penicillin in Bronchopulmonary Infection. — Medicated aerosol affords a new and promising approach to the treatment of bronchopulmonary diseases. Nebulized oxygen has been the substance used by a majority of workers. Prigal and his associates [25] describe the combined steam generator and aerosolizer and found that its use is capable of providing good therapeutic levels of penicillin in the blood.

Penicillin dissolves readily in propylene glycol to form an effective stable aerosol. The addition of glycerin (5 per cent) further stabilizes the aerosol. Usually high and prolonged levels of penicillin were obtained in the blood when a penicillin–propylene glycol aerosol was inhaled within a tent or from a breathing box. On the basis of their studies the high levels of penicillin in the blood may be accounted for, in part, by the use of propylene glycol as the diluent. Another contributory factor which probably accounts for the high blood levels obtained may be the use of steam. It may facilitate the absorption of penicillin by moistening and warming it as it is aerosolized. The tent method should be ideal for the treatment of infants and children or whenever continuous treatment with penicillin is indicated.

Acute suppuration of the lung always has been a difficult condition to treat. While drainage of the abscess through a bronchus has always been hoped for, in many instances surgical intervention is required. Alarcon [26] discusses the plans of therapy that were previously employed

25. Prigal, S. J.; McGavack, T. H.; Speer, F. D., and Harris, R.: Aerosol Penicillin, J. A. M. A. **134**:932 (July 12) 1947.

26. Alarcon, D. G.: Penicillin in Acute Suppurations of the Lung, Dis. of Chest **13**:211 (May-June) 1947.

and states that a large number of the patients ultimately required surgical treatment. Since advent of penicillin a decided change has been noted, and few acute pulmonary abscesses have reached the surgical stage.

Alarcon recommends the use of penicillin intramuscularly together with local instillation of penicillin into the cavity through the bronchoscope. A report of 8 cases is presented; in only 1 of these was it necessary to resort to surgical treatment, whereas formerly at least 50 per cent of patients required external drainage. He recommends that use of penicillin be continued as long as necessary to obtain definite clinical and hematologic improvement. This protracted use of penicillin must go beyond the average for other acute diseases. Under penicillin treatment, Alarcon believes, the cavities become sterile before they close, and the clinical improvement therefore seems to be more rapid than that observed roentgenologically. He concludes that when an immediate response to intramuscular administration of penicillin is not observed the bronchoscopic approach with instillation of penicillin is imperative.

In an effort to determine the efficacy of penicillin aerosol in the treatment of acute upper respiratory infections which are seen in the otolaryngologist's practice, Davis [27] employed penicillin aerosol and later combined it with streptomycin and treated many conditions such as acute sinusitis, nasopharyngitis, pharyngitis, laryngitis, tracheobronchitis and infectious asthma.

Penicillin was previously used in a strength of 50,000 to 100,000 units in 1 cc. of salt solution and inhaled daily. A combination of 100,000 units of penicillin calcium and 100,000 units of streptomycin in propylene glycol, 1 to 2 cc., is now used and is believed to be superior to penicillin alone. Obviously there are many factors which cannot be accurately checked. The results are best in those conditions which are caused by organisms affected by the drugs. Penicillin aerosol cannot be considered a cure-all, but it does serve as a valuable adjunct in some cases and in others is the sole form of therapy.

A group of 86 patients with chronic bronchiectasis were treated by nebulization therapy by Olsen,[28] either in preparation for surgical resection of portions of the lung or as a therapeutic measure when surgical intervention was contraindicated. Forty-six of them were treated preparatory to surgical resection, and the remaining 40 with bilateral bronchiectasis were considered unsuitable for operation.

---

27. Davis, D.: Inhalation of Penicillin Aerosol and Penicillin Streptomycin in Office Practice, Arch. Otolaryng. **46**:307 (Sept.) 1947.

28. Olsen, A. M.: Nebulization Therapy in Bronchiectasis: The Use of Penicillin and Streptomycin Aerosols, J. A. M. A. **134**:947 (July 12) 1947.

In all 86 cases penicillin aerosol was used; however, in 27, streptomycin hydrochloride was added to the penicillin solution for nebulization.

A glass nebulizer was connected by means of rubber tubing to an oxygen tank equipped with a reducing valve and flow meter. Isotonic sodium chloride solution was used most frequently for nebulization, and a standard solution of 10,000 units of penicillin per cubic centimenter was employed routinely. All patients who had bronchiectasis were hospitalized for aerosol therapy. Postural drainage was instituted in each case, and a careful record was kept of the daily quantity of sputum, as well as of its character, consistency and odor. Bronchoscopic examination was carried out in all cases, and complete bronchographic studies were made. At the time of bronchoscopic examination secretions were aspirated for bacteriologic study, and during treatment specimens of sputum were obtained at frequent intervals for follow-up bacteriologic study. In a majority of the surgical cases the volume of bronchial secretions was reduced considerably in the preoperative period of treatment. In the operable group of 40 patients there was satisfactory reduction of sputum in 21.

Streptomycin was used in combination with penicillin in a number of cases. In 14 who had not responded satisfactorily to penicillin aerosol alone and who had gram-negative bacilli in the sputum, 12 obtained a good result by inhaling the combined solutions.

Olsen states that treatment with an antibiotic agent in nebulized form appeared to be helpful in preparation of patients for lobectomy. There was definite reduction of bronchial secretions and eradication of many bacterial organisms, which made surgical resection an easier and safer procedure. The use of antibiotics by both aerosol and parenteral methods of administration should greatly reduce the morbidity and mortality from pulmonary resection for suppuration.

When nonsurgical bronchiectasis is treated, it must be borne in mind that the secondary infection rather than the primary disease is being treated and the bronchiectasis itself will not be influenced. Furthermore, the relief is temporary and patients usually will have to continue the use of aerosol therapy on an intermittent or modified program if they wish to maintain improvement. In addition, the bacteria in the bronchial secretions will become resistant to antibiotic preparations if their use is continued for long periods. This is particularly true of streptomycin.

Chronic bronchial infections are notoriously resistant to all methods of treatment. This commonly is due to interference with drainage caused either by gross anatomicopathologic changes or by muscular contraction. The retention of secretions produced by this mechanism is one of the factors in the chronicity of the infection.

In a study of the effects of penicillin by inhalation on chronic infections, Levine [29] selected a group of patients with histories indicating the presence of long-standing infection in whom all other methods of treatment, including bed rest, postural drainage, sulfonamide drugs by mouth and penicillin by injection, had been given without any striking improvement. In addition, there was definite bronchographic evidence of bronchiectasis.

Forty-two patients satisfying these criteria were treated over a period of two years, and all the patients have been followed for at least one year. Of the 42 patients treated, 19 had disappearance of symptoms and 14 had improvement in symptoms and general condition although some symptoms remained. In 8 there was no clinical improvement.

Penicillin was used as the agent of choice, and the apparatus employed was the glass nebulizer known as the vaponefrin vaporizer.* This is not held in the mouth but should be maintained at a slight distance from it so that the medicament may mix better with the inspired air. The concentrations of penicillin varied from 1,000 to 20,000 units per cubic centimeter. It did not appear that the concentration per se was an important factor in the determination of the end results. The amount used was 1 cc. of solution per administration. In the earlier work patients were instructed to inhale penicillin solution once in three hours, but later the frequency as well as the concentration was increased and soon the patients used the treatment on an hourly basis. Inhalation therapy appeared to be a definite method of treatment with a definite effect on bronchial disease. Unfortunately, a recurrence of symptoms with an entirely new bacterial flora as an indication of a new infection was found to be the rule rather than the exception.

In discussing the medical management of the patient with bronchiectasis, Mendenhall[30] expressed the opinion that unless there is some distinct contraindication every bronchiectatic patient should have at least one bronchoscopic examination and drainage. This often will reveal bronchial obstruction due to inflammatory polyps, tenacious secretion or plugs of debris which can be satisfactorily treated. Postural drainage arranged to suit each patient is of great importance. While the instillation of iodized oil may float out a great deal of secretion by its mechanical action and there may be some slight antiseptic action

29. Levine, E. R.: Inhalation Therapy in Chronic Bronchial Infections, Dis. of Chest **13**:295 (July-Aug.) 1947.

30. Mendenhall, E.: The Medical Management of the Bronchiectatic Patient, Dis. of Chest **13**:59 (Jan.-Feb.) 1947.

on the lining of the bronchi, there is a question whether repeated instillations are of benefit; they may cause harm. The same is true of bronchial lavage. The use of antiseptic solutions introduced directly into the bronchial tree is of doubtful value and often produces bronchitis and pneumonitis.

In a review of the trends of therapy in bronchiectasis in the past two decades, Perrone and his associates [31] refer to the medical literature presented during this period and point out that medical treatment has been unsatisfactory. It is the consensus that bronchiectasis is a surgical disease and cure can be secured only by excision of the diseased portion of the lung. They discuss prophylaxis and the importance of roentgen study and bronchoscopy when indicated and emphasize the care of pulmonary infections, particularly when occurring in early childhood. The most important factors in the causation of bronchiectasis are bronchial obstruction and infection. Bronchoscopy is of immeasurable value in the recognition and treatment of the many etiologic factors which undoubtedly lead to the development of bronchiectasis. Modern surgery for bronchiectasis has developed for the most part within the last decade and carries a mortality rate of approximately 3 per cent in most clinics. Surgical treatment is available in selected cases. At present little can be done for the patient with extensive bilateral bronchiectasis; it is therefore imperative that every effort be made to prevent or to minimize those conditions which lead to the development of bronchiectasis.

Permanent cure of bronchiectasis can be obtained only by pulmonary resection. According to Kay and his associates,[32] conservative therapy to improve bronchial drainage, combat infection and improve the general physical condition of the patient is of value and should be employed. Postural as well as bronchoscopic drainage, breathing and coughing exercises, eradication of foci of infection and other measures, including chemotherapy, are valuable adjuncts in the management of these patients. Penicillin is of value in the treatment of recurring pneumonic episodes and also decreases the amount of sepsis and intoxication during the interval stages. In no patient with advanced bronchiectasis, however, can sputum be made to disappear completely by these measures.

---

31. Perrone, J. A.; Whitaker, T. R., and Fleming, W. H.: The Trend of Treatment of Bronchiectasis During the Past Two Decades, Laryngoscope **57**:226 (March) 1947.

32. Kay, E. B.; Meade, R. H., Jr., and Hughes, F. A., Jr.: Surgical Treatment of Bronchiectasis, Ann. Int. Med. **26**:1 (Jan.) 1947.

NEOPLASMS OF TRACHEA AND BRONCHI

Neoplasms of Trachea.—In a report of a case of a primary carcinoid tumor of the trachea, Fisher [33] discusses the physical signs of tracheal tumor, which are cough, dyspnea and hemoptysis, with ultimately cyanosis and asphyxiation if growth of the tumor cannot be controlled. In many cases the earlier stages of the disease have been diagnosed as asthma. If tracheal tumor is suspected, a diagnosis usually can be made easily by direct examination of the trachea with biopsy. In the benign forms of tumor, endoscopic removal usually can be carried out. In a malignant tumor treatment is not so satisfactory, but fulguration of the growth by diathermy through the bronchoscope and irradiation therapy probably give the best results.

Fisher reports the case of a woman aged 60, whose chief complaint was asthma of eight years' duration. There was no hemoptysis. Bronchoscopy revealed a large tumor which almost completely obstructed the tracheal lumen a short distance above the carina. A biopsy was done, and a histologic diagnosis of carcinoid was made. The tumor was partially removed with biting forceps, and electrocoagulation was carried out. Insufficient time has elapsed to permit an ultimate report on the case.

A case of primary carcinoma of the trachea diagnosed and treated as a case of bronchial asthma was presented by Penta,[34] who was requested to make a bronchoscopic examination and secure secretions for vaccine. He found a pedunculated tumor in the lower third of the trachea which produced expiratory obstruction resulting in bilateral obstructive emphysema. The symptoms and physical signs were not unlike those commonly observed in bronchial asthma. The tumor was removed by bronchoscopy and the base destroyed by fulguration. The patient then received a course of roentgen therapy (total dose of 7,500 r). She has been observed bronchoscopically at stated intervals and has been well for practically five years without recurrence.

Lipoma of Bronchus.—Prior to the advent of bronchoscopy as a diagnostic aid, most benign bronchial tumors were found at autopsy, being part of the clinical picture seen in bronchiectasis, bronchial stenosis, atelectasis and pulmonary suppuration. Whalen [35] reports a case of lipoma in the left bronchus partially occluding its lumen in

33. Fisher, G. E.: Primary Neoplasm of the Trachea, South. Surgeon **13**:78 (Feb.) 1947.

34. Penta, A. Q.: Primary Carcinoma of the Trachea Removed by Bronchoscopic Procedure, Ann. Otol., Rhin. & Laryng. **56**:790 (Sept.) 1947.

35. Whalen, E. J.: Lipoma of the Bronchus, Ann. Otol., Rhin. & Laryng. **56**:811 (Sept.) 1947.

a man aged 61 years. The symptoms were chills and fever with pain in the chest of three days' duration. There was a history of similar previous attacks. A roentgen study of the chest revealed partial atelectasis of the left lung. At bronchoscopy the left bronchus was found occluded by a round, firm, smooth mass, attached by a broad base. Removal was difficult because the tumor was almost of cartilaginous hardness. After removal mediastinal and subcutaneous emphysema developed and the patient appeared acutely ill, but after four days of antibiotic therapy he made a complete recovery.

Adenoma.—Smith [36] reports a case of adenoma of the trachea occurring in a white woman aged 37 years which produced dyspnea with cough and asthmatic attacks. An irregular lobulated mass covered with normal-appearing mucous membranes was seen below the vocal cords by mirror laryngoscopy. The tumor did not appear suitable for endoscopic manipulation, and it was successfully removed by an external surgical approach. Five years has elapsed since removal of the tumor, and there has been no evidence of recurrence or metastasis.

Although adenoma of the bronchus may be potentially or actually a malignant tumor, Goldman's [37] observations indicate that clinically it is benign and may be treated as a locally invasive, very slowly growing epithelial tumor. Since a majority of these tumors are so situated that complete removal cannot be carried out by bronchoscopy, surgical extirpation seems to be the treatment of choice. Bronchoscopy is indicated in all cases to determine the location of the tumor and to secure specimen for biopsy. Further, bronchoscopic removal may be indicated if there is interference with aeration and drainage of the segment of lung distal to the tumor in preparation for pulmonary resection. It is also the definitive treatment for patients over the age of 60 or those who are poor surgical risks.

A case of benign adenoma of a bronchus occurring in an 8 year old girl is reported by McReynolds and Parrish.[38] From the history it is probable that the tumor has been present since the age of 3 years producing symptoms of partial bronchial obstruction which were erroneously diagnosed as being asthmatic because of the presence of a wheeze. With complete diagnostic studies, including bronchoscopy, the growth was discovered to originate in the bronchus to the upper lobe of the left lung. After bronchoscopic removal of the growth, the wheezing respiration disappeared and the temperature, previously

36. Smith, M. T.: Adenoma of the Trachea, Arch. Otolaryng. **46**:405 (Sept.) 1947.

37. Goldman, A.: The Surgical Treatment of Bronchial Adenoma, Dis. of Chest **13**:321 (July-Aug.) 1947.

38. McReynolds, G. S., and Parrish, R. E.: Adenoma of the Bronchus, Ann. Otol., Rhin. & Laryng. **56**:766 (Sept.) 1947.

elevated, returned to normal. Bronchographic studies revealed extensive bronchiectasis of the upper lobe of the left lung. Surgical treatment was recommended but was rejected by the patient's family.

Bronchogenic Carcinoma.—In discussing the diagnosis and treatment of bronchogenic carcinoma, Hollingsworth [39] states that there are two periods of delay during which the patient may forfeit his chance for cure. The first is between the onset of symptoms and medical consultation, and the second is between the first medical consultation and establishment of a positive diagnosis. In considering the various diagnostic methods, he expresses the opinion that bronchoscopy is by far the most important procedure in establishing a diagnosis. Biopsy can be done, and the location and extent of the growth in the bronchus or bronchial wall can be ascertained. Occasionally a lesion, grossly carcinomatous in appearance, is seen even though the biopsy report may be negative. Repeated bronchoscopic biopsies usually will result in a positive histologic diagnosis. A positive bronchoscopic biopsy is dependent on the location of the lesion in one of the accessible bronchi or growing out of one of the primary or secondary branches. In Hollingsworth's cases bronchoscopy was performed in all 77 of the operable cases and in 112 of the 154 inoperable group. Positive biopsy evidence was obtained in 47, or 61 per cent, of those in which operation was performed.

Next to exploratory thoracotomy with a diagnostic biopsy, Rigler [40] considered bronchoscopy with biopsy the best method for a conclusive diagnosis of bronchogenic tumor. Early recognition of tumor formation may be obtained by mass survey, but this is insufficient because it is necessary to establish the primary character of the lesion. From the roentgen standpoint the most characteristic picture of bronchogenic carcinoma is the multiformity of its manifestations. Any patient over 40 with respiratory symptoms should have roentgen study. Indeterminate shadows warrant exhaustive follow-up studies.

In discussing the diagnostic aspects of carcinoma of the lung, Ochsner and his associates [41] consider bronchoscopic examination with biopsy the most accurate diagnostic method, since this procedure permits not only visualization of the tumor but also resection of a portion for examination. Unfortunately, it is of no value in case of peripherally situated tumors and these constitute a large group;

39. Hollingsworth, R. K.: Bronchogenic Carcinoma: An Analysis of Three Hundred and Forty-Three Cases, Ann. Int. Med. **26**:377 (March) 1947.

40. Rigler, L. G.: The Early Diagnosis of Carcinoma of the Lung, Journal-Lancet **67**:243 (June) 1947.

41. Ochsner, A.; DeBakey, M., and Dixon, J. L.: Primary Carcinoma of the Lung, J. A. M. A. **135**:321 (Oct. 11) 1947.

in the authors' series the lesion was found in the upper lobes in 49 per cent of all patients on whom resection was done. Of the 147 cases in which pulmonary resection was performed for cancer, bronchoscopic examination was done in 125. In the remaining cases the procedure was not used because of the peripheral location of the tumor. Of the 125 bronchoscopic examinations performed, positive biopsy evidence was obtained in 61 (41.5 per cent of the total cases).

Jones [42] considers bronchoscopy next in importance to roentgenography as aid in the diagnosis of bronchogenic carcinoma. In his experience, bronchoscopy will yield diagnostic tissue for a biopsy or information leading to a presumptive diagnosis in between 60 and 75 per cent of cases. In addition to giving either positive or presumptive information regarding the diagnosis, bronchoscopy is of value in improving the patient's condition for anticipated surgical procedures by removing infected secretions beyond the point of obstruction.

Ochsner and his associates [43] present a comprehensive detailed analysis of 360 cases of carcinoma of the lung observed during an eleven year period, from 1936 to 1946 inclusive. From a clinical standpoint, it is their impression that the picture in their cases was not characteristic and the onset was insidious. The commonest symptoms, as others have observed, were cough, loss of weight, discomfort in the chest and hemoptysis, but in many of the early cases only one or two of these symptoms were present. In the early cases physical signs are likely to be negative.

A positive roentgen diagnosis was made in 81 per cent of cases. Bronchoscopy was done in 112 cases, and a biopsy specimen was obtained in 61 per cent. Eighty-one per cent of these were positive. In 17 of the 129 cases the roentgen study showed the tumor to be so peripherally situated that bronchoscopy was not done.

The authors condemn aspiration biopsy because of the danger of pleural implantation. They report that they had 2 such cases.

In reporting 2 cases of lipid pneumonia simulating bronchogenic carcinoma which were treated surgically on the assumption that a carcinoma was present, Janes [44] concludes that this condition must be considered in the differential diagnosis. Roentgenograms of both patients were reviewed by several competent radiologists, and, while they were not considered as typical of bronchogenic carcinoma, this

42. Jones, J. C.: Surgical Aspects of Bronchogenic Carcinoma, J. A. M. A. **134**:113 (May 10) 1947.

43. Ochsner, A.; DeBakey, M., and Dixon, J. L.: Primary Pulmonary Malignancy Treated by Resection, Ann. Surg. **125**:522 (May) 1947.

44. Janes, R. M.: Lipoid Pneumonia Simulating Bronchogenic Carcinoma, J. Thoracic Surg. **16**:451 (Oct.) 1947.

was believed to be the most probable diagnosis and, in the absence of further positive findings, an exploratory thoracotomy was performed. The disturbing feature in these cases was that in neither was the amount of oil used excessive, from either the point of view of individual instillation or the length of time over which the treatment extended. It seemed that there must be an individual susceptibility to development of lipid pneumonia, since many persons used larger quantities of oil than did either of these patients without apparent ill effects.

In a study of autopsy records, Henkin [45] reviewed the incidence of bronchogenic carcinoma and found that during the period investigated there was a marked actual increase of cases. He expresses the opinion that it soon may rank first among malignant neoplasms causing death in the male.

Pulmonary Cyst.—In the experience of Moersch and Clagett,[46] the diagnosis of pulmonary cysts is at times relatively easy but errors in diagnosis are characteristic of the condition. Pulmonary cysts with a bronchial communication are more likely to give rise to clinical symptoms than those in which such a communication does not exist, although the latter can give rise to clinical symptoms due to pressure on neighboring bronchi and development of bronchial infection. Cough, expectoration, hemoptysis, thoracic pain and attacks of fever are the chief symptoms commonly observed in cases of pulmonary cysts.

In the experience of these authors, bronchoscopy has seldom been of positive value in the diagnosis. It is of value in excluding other pulmonary lesions which might at times present a picture resembling pulmonary cysts. They also found bronchography to be of little value in the diagnosis of cysts other than cystic bronchiectasis. This is due to inability to get oil into the cysts by the methods commonly used. Direct injection of oil into the pleural space or into the cyst itself, as suggested by Singer, gives more valuable information in diagnosis than does bronchography. When there is doubt as to the diagnosis, exploratory thoracotomy is recommended.

Biplane Fluoroscopy.—While the biplane fluoroscope is not necessary in a majority of cases of foreign body, there are instances in which its use is extremely helpful or absolutely necessary. Hagens [47] concludes that when it is possible to have the help of biplane fluoroscopy

45. Henkin, W. A.: Bronchogenic Carcinoma: A Clinical-Pathological Study of Thirty-Six Autopsied Cases Seen at the Brooklyn Cancer Institute Between 1937 and 1945, Inclusive, Ann. Int. Med. **27**:243 (Aug.) 1947.

46. Moersch, H. J., and Clagett, O. T.: Pulmonary Cysts, J. Thoracic Surg. **16**:179 (April) 1947.

47. Hagens, E. W.: Endoscopic Use of the Biplane Fluoroscope, Arch. Otolaryng. **46**:382 (Sept.) 1947.

endoscopy is much safer and better work is done. It is to be used as an aid and not as a substitute for the usual technic. Biplane fluoroscopy helps to localize foreign bodies that cannot otherwise be found, to furnish accurate and immediate information when the foreign body changes its position rapidly, comes apart or breaks, to determine whether the grasp on the foreign body is proper or not and to find the new position of an object which has suddenly disappeared from view, thus obviating unnecessary manipulation and roentgen examination.

FOREIGN BODIES IN AIR AND FOOD PASSAGES

In a report covering a series of 72 cases of foreign bodies in the air passages, a majority of which were of vegetable origin, Otte[48] recorded in detail the symptoms, physical signs and the roentgen findings. In cases of laryngeal foreign bodies he did not use general anesthesia, but in the remaining cases a general anesthetic was used without accident. He does not consider the dyspnea caused by foreign body sufficient to contraindicate the use of a general anesthetic. The same can be said of the postoperative pulmonary complications which could be aggravated by the general anesthetic, but with the use of sulfonamides and antibiotics this no longer constitutes a hazard.

In the experience of Bonnier,[49] peanuts in the air passages of children present a frequently encountered foreign body. The 45 cases presented constitute 60 per cent of a total of 75 in which foreign bodies were removed from the air passages. Thirty-three of the patients were children, varying in age from 8 months to 10 years. About 80 per cent were in the 1 to 3 year age group. Thirty patients, or 66 per cent, gave an indefinite history of having choked on peanuts. The duration was of a few hours to ten months. Thirty of the foreign bodies were lodged in the right bronchus and eleven in the left bronchus. Three remained in the trachea above the carina.

There were 5 deaths in the series, which the writer attributed to the age of the patient and to the severity of the obstruction, both irritative and infective. Thirteen of the patients were treated before antibiotics became available, and, of these, 3 died of pulmonary infection. Since penicillin has been used, 30 patients have been treated, with only 2 fatalities.

Circular flat foreign bodies in the esophagus commonly assume a characteristic position, with the greater axis in the coronal plane and the lesser axis in the sagittal plane of the body. Coins are classic

48. Otte, J.: A Study of Seventy-Two Cases of Foreign Bodies in the Air Passages, Rev. otorrinolaring. **7**:11 (March) 1947.

49. Bonnier, M.: Forty-Five Cases of Peanuts Removed from the Lower Respiratory Passages, Ann. Otol., Rhin. & Laryng. **56**:784 (Sept.) 1947.

examples of this type of body. Schwartz [50] reported a case in which the reverse was true. In this case, a quarter, swallowed by a child aged 7 years, appeared on edge in the sagittal plane, and in the lateral view the object showed its full circular aspect. It had lodged at about the level of the body of the third thoracic vertebra and was slightly to the left of the trachea, pushing this somewhat to the right. Schwartz explained the position of the coin as resulting from the influence of the bulge of the arch of the aorta which deviated the coin, causing its left edge to be directed posteriorly while the anterior, or right edge was directed anteriorly, being wedged along the left margin of the trachea. A search of the literature and personal communications indicate that this is probably the first case of its kind on record.

Equen [51] reports additional cases of magnetic foreign bodies that were removed with the alnico® magnet. In 1, a safety pin was removed from the esophagus of an infant aged 9 months by pushing the open safety pin into the inflated stomach with the magnet and then withdrawing it. Additional cases were removal of a common pin from the bronchus of an adult and three bobby pins from the stomach of a woman. Magnetic aid greatly simplifies the problem of removing magnetic metallic foreign bodies both from the air passages and from the stomach.

While foreign bodies may be retained in the air or food passages for long periods without producing symptoms, in a majority of cases untoward effects develop. Friedman [52] reported 2 cases of large foreign bodies in the hypopharynx which ultimately were discovered; both patients made uneventful recoveries following endoscopic removal. In 1, a child 12 weeks of age had swallowed a large open safety pin seven weeks previously and it had lodged in the pharynx. Its presence was not detected until the point of the pin was seen protruding into the soft tissues of the neck. The pin was removed by pharyngoscopy without difficulty, and the patient made a prompt recovery. The second patient, a 14 month old girl, had a large plastic button in the hypopharynx which had been overlooked roentgenologically on several occasions. With increasing difficulty in breathing and swallowing the patient was admitted to the hospital and further studies made. In the lateral roentgenogram the upper segment of a foreign object could be seen in the upper cervical portion of the esophagus. No difficulty was encountered in its removal, and the patient recovered completely.

---

50. Schwartz, V. J.: Unique Case of Foreign Body in the Fsophagus, Arch. Otolaryng. **45**:562 (May) 1947.

51. Equen, M.: Magnetic Removal of Foreign Bodies from the Food and Air Passages, Arch. Otolaryng. **46**:225 (Aug.) 1947.

52. Friedman, H. S.: Foreign Bodies Retained in Infants, Arch. Otolaryng. **45**:357 (March) 1947.

Esophageal foreign bodies are always dangerous because of the possibility of perforation by the foreign body itself, by instrumentation or, if the foreign body is left for any length of time, by erosion of the object through the wall of the esophagus. Lyman [53] reported a case in which a bone in the esophagus was discovered by roentgen study. An attempt was made to perform an esophagoscopy but because of anatomic difficulties and lack of cooperation of the patient there was much retching with vomiting and the bone was ejected. Esophagoscopy then was done, and a small excoriation was observed on the right lateral wall of the esophagus at the level of the cricopharyngeal muscle. Because of trauma administration of penicillin was started. The following day subcutaneous emphysema was noted about the suprasternal notch, and there was diffuse swelling of the right side of the neck. The next day there was widening of the mediastinum with dyspnea and apparently atelectasis of the lower lobe of the right lung with an early pleural effusion. Bronchoscopy was attempted, but this too was difficult to perform and because of laryngeal spasm it was necessary to do an emergency tracheotomy. Bronchoscopy was completed, but no obstruction of the bronchus was found. The patient's course continued stormy, and pleural effusion developed which was treated by aspiration; in addition, he was given sulfadiazine. The patient ultimately recovered. The conclusion drawn from this case is the importance of prompt and adequate use of antibiotics in any case of foreign body in the esophagus with damage to the esophageal wall. It is without question the most important aid in the treatment of severe sepsis that is likely to occur in this type of case.

Periesophagitis.—Periesophageal infection secondary to trauma from foreign body instrumentation presents one of the most serious problems in therapy. Early accurate diagnosis and prompt and adequate treatment are imperative to avert a fatal issue. Wolcott [54] reports 4 cases of periesophageal infection, in 3 due to the presence of a foreign body and in the fourth occurring after esophagoscopy for a neoplasm. In all, it was necessary to resort to external mediastinotomy. Wolcott considers early esophagoscopy absolutely essential in the presence of a foreign body. Mediastinotomy should be done promptly in all cases that do not show rapid improvement. Adequate chemotherapy, especially a powdered sulfonamide placed on the tongue, will, in his estimation, build up a high local concentration in the hypopharynx and in the esophagus. Wolcott expresses the opinion that by following this regimen the mortality rate will be greatly reduced.

---

53. Lyman, E. H.: A Case of Esophageal Foreign Body with Mediastinitis and Other Complications, Laryngoscope **57**:400 (June) 1947.

54. Wolcott, C. C.: Periesophagitis, Laryngoscope **57**:45 (Jan.) 1947.

Equen and his associates [55] report the first case of peroral removal of a foreign body in the duodenum through the natural channels. A sixpenny finishing nail was swallowed by a 4½ year old boy and lodged in the duodenum. It remained in the second portion of the duodenum for six days without progression. A magnet attached to a string was swallowed and four and a half hours later made contact with the nail. The magnet and the foreign body were removed under fluoroscopic guidance.

DISEASES OF THE ESOPHAGUS

Atresia of Esophagus.—Perrone and his associates [56] report a series of 6 cases of congenital atresia of the esophagus, all of which terminated fatally. In reviewing the histories there was noted excessive mucus in the mouth and throat sometime during the first few days of life. The remarkably constant occurrence of choking at feedings, regurgitation of feedings, accumulation of mucus and cyanosis should immediately direct attention of the physicians to atresia of the esophagus as a diagnostic possibility. Congenital atresia of the esophagus no longer is a hopeless anomaly but one that can be corrected surgically provided the diagnosis is made early. Pediatricians and obstetricians, therefore, should be on the lookout for these cases, particularly if there is any question of symptoms referable to the swallowing function and an accumulation of secretions in the mouth and throat with attacks of cyanosis.

Longmire [57] reports 4 cases of tracheoesophageal fistula and esophageal atresia in which ligation of the fistula and primary esophageal anastomosis was performed. In 2 patients a stricture developed at the anastomosis. Esophagoscopy demonstrated the anastomosis to be well healed but narrowed in 1 patient; in the other patient the lumen at the anastomosis was narrowed and partially obstructed by granulation tissue. Both patients were treated by retrograde dilation and gained weight and were able to take all feedings by mouth. The author believes that a localized stricture of this type will respond better to dilation than the usual type of caustic or traumatic stricture, and the increase in the size of the esophagus with growth of the child will help to increase the lumen of the stenotic area.

Esophageal Injuries.—Diseases and injuries of the esophagus were encountered in 133 patients over a three year period in an Army thoracic

55. Equen, M.; Gilliam, R., and Lineback, M.: Nail in Duodenum Removed by Magnet, J. A. M. A. **135**:432 (Oct. 18) 1947.

56. Perrone, J. A.; Fleming, W. H., and Whitaker, T. R.: Congenital Atresia of the Esophagus with Tracheobronchial Fistula, Arch. Otolaryng. **46**:608 (Nov.) 1947.

57. Longmire, W. P., Jr.: Congenital Atresia and Tracheoesophageal Fistula, Arch. Surg. **55**:330 (Sept.) 1947.

surgery center by Kay,[58] who reports that 42 patients were operated on and the remaining 91 treated by instrumental dilation or conservative measures or did not require treatment. Of 27 patients with cicatricial stenosis, instrumental dilation over a previously swallowed string as a guide was effective in 21 patients. There were 3 benign intramural esophageal tumors, 2 leiomyomas and 1 neurofibroma and 5 esophageal carcinomas. Five esophageal cysts arising between the submucosa and muscularis, 2 dermoid cysts, 2 simple cysts and 1 bronchogenic cyst were encountered. There were 4 traction, 3 pulsion and 2 epiphrenic diverticulums. Traumatic injuries of the esophagus were seen in 10 patients, in 7 caused by shell fragments and in 1 by a bayonet; in 2 the injuries resulted from instrumental perforation during esophagoscopy. Only 1 patient with esophageal varices was seen. Twenty patients with cardiospasm were treated. In 8 patients with moderate degrees of cardiospasm satisfactory symptomatic improvement resulted from instrumental dilation, although there was no evidence of reduction in the size of the esophagus afterward. Transpleural cardioplasty was performed in 11 patients not significantly improved by instrumental dilation. Twenty-three patients with a congenitally short esophagus, 1 of whom had a carcinoma at the esophagogastric junction, were observed. Of this number, 3 with a high grade stricture and 6 with ulceration responded to instrumental dilation and a modified Sippy regimen.

Cicatricial Stenosis.—Blassingame and his associates[59] advocate prompt esophageal dilation by the Salzer technic in cases of lye burns of the esophagus. A study of their cases prior to the introduction of this method of treatment revealed that in 50 per cent of all patients who had ingested lye and were seen within forty-eight hours esophageal strictures requiring gastrostomy developed. Since the Salzer technic has been used, gastrostomy has not been required in a single case. Those patients in whom strictures had already developed required dilation and gastrostomy. It is emphasized that early treatment of lye burns prevents severe stricture formation. If the patient is seen after stricture formation, treatment must consist of dilations, either through the mouth or by a retrograde method through a gastrostomy opening, unless the stricture is situated in the lower third of the esophagus and can be resected with end to end anastomosis.

Sweet and his associates[60] direct attention to another cause of inspiratory stridor in infants—an anomalous aortic vascular ring with

58. Kay, E. B.: Surgical Lesions of the Esophagus Seen in an Army Thoracic Surgery Center, J. Thoracic Surg. **16**:207 (June) 1947.

59. Blassingame, C. D.; McArthur, R. H., and Atkinson, R. H.: Ingestion of Lye—a Serious Problem, South. Surgeon **13**:626 (Sept.) 1947.

60. Sweet, R. T.; Findlay, C. W., Jr., and Reyersbach, G. C.: The Diagnosis and Treatment of Tracheal and Esophageal Obstruction Due to Congenital Vascular Ring, J. Pediat. **30**:1 (Jan.) 1947.

a large right aortic arch—and report 2 cases in which treatment was surgical. In this anomaly the stridor is usually noticed at birth, becomes aggravated when the infant is fed and during infections of the upper respiratory tract and is commoner than dysphagia. Roentgenograms reveal a forward and lateral displacement of the trachea and esophagus. When these abnormalities are present, esophagoscopy is considered unwise because of the danger of perforation.

NEOPLASMS OF THE ESOPHAGUS

Carcinoma of Esophagus.—In the opinion of Taquino and Joseph,[61] the solution of the problem of carcinoma of the esophagus in the average case still seems far off. A study of 145 cases of proved carcinoma of the esophagus revealed advanced disease, widespread metastasis with extensions and nonresectability and almost a 100 per cent mortality. Two patients had radical operations and still were alive and free from disease at the end of one year. Six patients who had irradiation therapy by a new technic were kept alive from nine to eighteen months. All the other patients in this series either are dead or have no hope of survival because they were not submitted to any procedure which gave any chance of life.

Advances in surgery and in irradiation are applicable only to the small and highly favored group of patients whose disease is recognized early enough that these measures can be useful. Hope for the rest lies in the recognition by physicians in general that even the most trivial symptoms which might point to disease must be fully and repeatedly investigated. Since esophagoscopy and biopsy are the definite diagnostic methods, the responsibility of the esophagologists for the end results in this disease is correspondingly heavy.

Puppel [62] lists four outstanding factors which lead to too late radical surgical treatment of carcinoma of the lower esophagus. Infrequent esophagoscopy and exploratory thoracotomy constitute a definite factor in late diagnosis, along with lack of education of the public concerning the early signs of esophageal cancer and the fact that the first signs and symptoms may appear late in the course of the disease.

Management of carcinoma of the postcricoid and cervical esophageal regions is a more difficult problem than that of laryngeal carcinoma, because of the anatomic characteristics of this region. In discussing this subject, Woodward [63] reports on 13 patients whose tumors occurred in

61. Taquino, G. J., and Joseph, G. F.: Carcinoma of the Esophagus: An Analysis of One Hundred and Forty-Five Cases, with Special Reference to Metastases and Extensions, Ann. Otol., Rhin. & Laryng. **56**:1041 (Dec.) 1947.

62. Puppel, I. D.: Early Diagnosis in Radical Resection of Carcinoma of the Lower Esophagus, Am. J. Surg. **73**:695 (June) 1947.

63. Woodward, F. D.: The Surgical Treatment of Postcricoid and Cervical Esophageal Carcinoma, Ann. Otol., Rhin. & Laryng. **56**:1035 (Dec.) 1947.

these regions. Dysphagia was the most prominent symptom and had been present from two to twelve months, the average duration being seven months. Hoarseness was rare except in advanced and extensive postcricoidal tumors. Pain in the throat, chest and back was noted, as well as reflex pain to the ear. Of the 13 patients, 5 were operated on. It is Woodward's opinion that wide excision of these tumors and adjacent structures when necessary followed by radiation therapy offers the only hope of cure at this time. His experience with irradiation alone has not been satisfactory, and he therefore recommends surgical intervention followed by irradiation. Of the 5 patients operated on, 3 have survived and apparently are free from disease.

Hemangioma of Esophagus.—In a search of the literature, Ferguson and Hackworth [64] were unable to find any reports of hemanigioma of the esophagus occurring in infancy; in fact only 1 case of hemangioma of the esophagus occurring in a man was reported. In their case, that of a child aged 7 years, the complaints were of melena and hematemesis which had been observed since the age of 10 days and continued at irregular intervals until the patient was examined. Functional studies of the esophagus showed continuous relaxation of the cardiac end of the stomach on one occasion, and a second study revealed a minute filling defect in its distal few centimeters. At esophagoscopy a bleeding point was observed on the anterolateral wall of the esophagus, but because of the bleeding a satisfactory examination could not be performed. At a subsequent examination there was observed a slightly raised area of friable tissue which suggested granulation. A biopsy specimen was reported as indicating hemangioma. Irradiation therapy was instituted, and the patient was given 1,000 r in divided doses. After five treatments there was no further vomiting or recurrence of bleeding, and an examination carried out during follow-up two years later revealed absence of tumor and complete freedom of symptoms.

Leiomyoma of Esophagus.—Benign tumors of the esophagus are rare and commonly are encountered at autopsy as incidental observations. In the case of leiomyoma of the esophagus reported by Schafer and Kittle,[65] a diagnosis of an eccentric diaphragmatic hernia was made by roentgen study. Esophagoscopy had not been performed. Surgical treatment was carried out. It was obvious when the lower esophagus was investigated that there was no visceral herniation and that the mass shown on the roentgenograms was a tumor. This was successfully resected and proved to be a leiomyoma.

64. Ferguson, C. F., and Hackworth, L. E.: Hemangioma of the Esophagus in Infancy, Arch. Otolaryng. **45**:585 (May) 1947.

65. Schafer, P. W., and Kittle, C. F.: Esophageal Leiomyoma, J. A. M. A. **133**:1202 (April 19) 1947.

Varix of Esophagus.—Injection of a sclerosing solution for the treatment of esophageal varices was first reported in 1939. The early results were encouraging but it was not possible to evaluate this plan of treatment because of insufficient time to determine the ultimate benefits.

Moersch [66] reports the results of treatment in 22 cases of varices of the esophagus in which gastrointestinal hemorrhages occurred. The patients were treated by injection of a sclerosing solution into the varices through the esophagoscope. Twelve of the patients have had no further bleeding after treatment, and all of these have gone longer than three years without bleeding. Eight of the group have gone more than four years without bleeding. Patients in whom satisfactory results were not obtained by injection invariably were found to have varices in the cardiac end of the stomach as well as in the esophagus, but this was not true in the successfully treated patients.

In cases of varices in which the cardiac end of the stomach as well as the esophagus is involved some form of treatment other than that of injection of a sclerosing solution should be considered. Portal-caval anastomosis or resection of the cardiac end of the stomach and lower end of the esophagus has been considered, and such alternate forms of treatment eventually may become the procedure of choice in uncomplicated cases of esophageal varices.

Roentgenologic examination is of great value in the diagnosis of esophageal varices but is not infallible. In doubtful cases esophagoscopy should be employed.

Hiatal Hernia.—Wells [67] reports a case of esophageal obstruction which lasted about sixteen days in a patient on whom gastrectomy had been done. On esophagoscopy a mass was seen obstructing the lower end of the esophagus about 5 cm. above the level of the diaphragm. Biopsy specimens were reported as gastric mucosa on one occasion and esophageal mucosa on the other. Subsequent examination suggested a small hiatus hernia. The author's explanation of the intraesophageal mass was a herniation of the stomach into the lower end of the esophagus.

Bloom [68] reviews the most important features of hiatus hernias and reports 6 cases in which the hernias were mistaken for other conditions. He stresses the roentgenologic method of demonstrating the hernia. He describes a method of filling the entire esophagus with barium suspension to outline better any herniation.

---

66. Moersch, H. J.: Esophageal Varices, J. A. M. A. **135**:754 (Nov. 22) 1947.

67. Wells, J.: Herniation of Gastric Mucosa into the Esophagus, Am. J. Roentgenol. **58**:194 (Aug.) 1947.

68. Bloom, J.: Hiatus Herniæ (New Method of Demonstrating Hiatus Herniæ Radiologically), Canad. M. A. J. **57**:9 (July) 1947.

Stapleton [69] found 24 cases of hiatus herniation in 522 roentgen examinations, an incidence of 4.6 per cent. Roentgen examination of the patient in the prone position was necessary for diagnosis. Four cases with different symptomatologies are reported.

In an attempt to describe the various schools of thought on the therapeutic approach to the problem of esophageal perforations in the preantibiotic period as well as at the present time, Lederer and his associates [70] present 3 illustrative cases and discuss briefly additional case reports.

When a diagnosis of perforation is made, they recommended the following course of management: penicillin in large doses intramuscularly every two hours; no foods or fluids by mouth; intravenous therapy to be instituted for feeding purposes. The patient should be placed in the Trendelenburg position to prevent drainage of oral secretions in the esophagus. One hundred per cent oxygen should be administered continuously to help combat cyanosis, dyspnea and restlessness. Sedation in the form of meperidine hydrochloride (demerol hydrochloride®) is preferred when sedation is necessary. The bacterial flora may vary a great deal; hence it is important to have anaerobic as well as aerobic investigations carried out. Small and repeated blood transfusions may be given. Sulfadiazine and streptomycin should be started as early as possible.

The indications for mediastinotomy are a history of known esophageal trauma, roentgen evidence of air in the tissues, clinical symptoms and signs of prevertebral or mediastinal emphysema and the course of the leukocyte count, the pulse and the temperature.

GASTROSCOPY

Technic.—By means of a transparent balloon attached to the lower end of a gastroscope, the hitherto blind areas on the lesser curvature of the antrum and the posterior wall of the corpus were visualized in 12 of 13 patients by Colcher.[71] The balloon covers the rubber finger, the electric bulb and the objective and is attached immediately above the objective. A noncollapsible tube is necessary for the insufflation and withdrawal of air. The gastroscope is introduced in the usual manner and air injected into the balloon. The position of the pylorus and obliteration of the rugae vary with the degree of distention. From Colcher's experience, it appears that the experienced gastroscopist who

69. Stapleton, J. G.: Esophageal Hiatus Hernia, Canad. M. A. J. **57**:13 (July) 1947.

70. Lederer, F. L.; Grossman, A. A., and Donnelly, W. A.: Present-Day Concepts on the Treatment of Esophageal Perforations, Ann. Otol., Rhin. & Laryng. **56**:867 (Dec.) 1947.

71. Colcher, H.: Gastroscopy with Transparent Balloon, Am. J. Med. **3**:423 (Oct.) 1947.

will take the time to train himself in this method will find it useful for selected patients in whom a lesion is difficult to visualize because of its location in a blind area of the stomach.

Moersch [72] believes that gastritis is the condition most frequently confused gastroscopically with carcinoma. A review of 100 selected cases of proved carcinoma of the stomach showed that an incorrect diagnosis of gastritis had been based on gastroscopic examination in 11 instances. In 6 cases of proved gastritis the surgeon at operation experienced difficulty in determining whether the gastric lesion was benign or malignant, and the final diagnosis had to rest on microscopic examination of the gastric tissue.

Gastric Polyps.—Gastroscopy is generally considered the best means of recognizing polyps, particularly if they are small, and of differentiating them from malignant neoplasms and from pseudopolyps of hypertrophic gastritis. Among 1,725 patients with gastroscopic examinations, Paul and Logan [73] found 10 with gastric polyp and 30 others in whom the diagnosis of polyp was questionable.

Gastric Varices.—Gastroscopically, with the stomach partially distended, gastric varices appear tortuous, turgid and bluish. They are most commonly seen along the anterior wall of the stomach near the lesser curvature just below the esophageal hiatus; they bisect the rugae at an angle of about 45 degrees and rarely extend down beyond the middle third of the stomach. It is not generally recognized that severe gastrointestinal bleeding may occur secondary to gastric varices. In 6 patients of this type studied by Moersch,[74] the roentgenologic examination revealed the presence of both esophageal and gastric varices in 4 and varices of the stomach were demonstrated gastroscopically in all 6. In the 2 patients with negative results of roentgen examination the bleeding point was found in a gastric varix at necropsy.

---

72. Moersch, H. J.: The Gastroscopic Differentiation of Gastritis from Carcinoma of the Stomach, Gastroenterology **8**:284 (March) 1947.

73. Paul, W. D., and Logan, W. P.: Polyps of the Stomach with Reference to the Gastroscopic Findings, Gastroenterology **8**:592 (May) 1947.

74. Moersch, H. J.: Gastroscopy in the Diagnosis of Gastric Varices, Bull. Am. Gastroscopic Club **3**:4, 1947.

News and Comment

Home Study Courses.—Home study courses in the basic sciences related to ophthalmology and otolaryngology, offered as a part of the educational program of the American Academy of Ophthalmology and Otolaryngology, will begin on September 1 and continue for ten months. Registrations must be completed before August 15. Detailed information and application forms may be secured from Dr. William L. Benedict, 100 First Avenue Building, Rochester, Minn.

Book Reviews

Language and Language Disturbance. By Kurt Goldstein, M.D. Price, $8.75. Pp. 374. New York: Grune & Stratton, Inc., 1948.

Dr. Goldstein, whose studies of the problem of aphasia have won him world recognition, presents in this book much clinical material and includes his own theory of the mechanisms underlying language disturbances. Approximately the first quarter of the book is devoted to the physiology and the psychology of language, with emphasis on what Goldstein calls the "organismic" approach to the subject. He implies that the use of language and its abnormalities have both organic and psychologic bases and consequently should be approached from both standpoints. The rest of the book consists of a wealth of case presentations, accompanied with methods of examination and explanations for the various findings. A short final chapter is devoted to the fundamentals of therapy.

That the subject of aphasia is in need of clarification is evidenced by the brief summaries in various textbooks of the theories concerning it and by the fact noted that many cases fit none of these theories. Goldstein believes this is due largely to one's failure to comprehend how far reaching the effects of a local lesion can be on the entire personality. The physician's lack of an "organismic" point of view leads him, for example, to misinterpret as aphasia what actually is an inhibition of the patient arising from his difficulty in handling situations when he is also handicapped by organic disease. It is undoubtedly true that we physicians habitually attempt to handle these problems purely on a neurologic basis and that we could improve our methods by orientation along the lines described by the author.

More than forty years of work in the field, a penetrating mind and a great breadth of view have enabled Dr. Goldstein to produce this book, which will be a welcome guide to physicians, psychologists and educators interested in this subject so little understood.

Abstracts from Current Literature

Ear

COMPLICATIONS OF ACUTE OTITIC MENINGITIS. ARCHIBALD L. HOYNE, Am. J. Dis. Child. **75**:741 (May) 1948.

Meningitis caused by bacteria was uniformly fatal until about ten years ago. Infection extending from the ears, the nasal sinuses or the upper respiratory tract in general is common. Convulsions often usher in an attack, but they are seen in other infections as well. When the eyes are involved, photophobia is a painful sequence, but conjunctivitis may be prodromal to loss of vision, since it is the first sign of impending ophthalmitis in one or both eyes, usually one. When deafness takes place, it is commonly bilateral, and irreversible, but, of 669 patients, only some 2.4 per cent lost their hearing! Otitis media caused by Streptococcus, Staphylococcus, Pneumococcus or a Klebs organism often initiates the train of circumstances leading to meningitis. Strabismus, diplopia, ptosis and facial paralysis are often associated with the aural involvement. Hoyne cites intrathecal meddling as a frequent cause of untoward events in the past, but since the sulfonamides and antibiotics have been given, these complications are fewer. He regards frequent spinal drainage as unnecessary. It should be done to determine the diagnosis only. "Witholding intrathecal therapy in all forms of meningitis is an important means of diminishing complications and lowering fatality rates."

VOORHEES, New York.

PROGNOSIS IN THE HARD-OF-HEARING CHILD. D. E. STAUNTON WISHART, Laryngoscope **57**:460 (July) 1947.

It is in children that the otologist has the greatest opportunity to restore hearing. Methods of testing hearing have not been standardized. The audiometer will easily test the threshold hearing for pure tones, but it does not test the ability to hear speech. In addition to the pure tone audiometer, the otologist should have a phonograph audiometer with certain recordings. The instruments must be used correctly or the results will be misleading; proper methods are described. The otologist should do the testing himself, rather than leave it to a trained technician.

HITSCHLER, Philadelphia.

Pharynx

CONTROL OF POST-TONSILLECTOMY AND POST-ADENOIDECTOMY HEMORRHAGE BY DOUBLE-STRENGTH POSTERIOR PITUITARY SOLUTION. J. W. MCLAURIN, Laryngoscope **57**:1315 (Dec.) 1948.

Bleeding following tonsillectomy and adenoidectomy was controlled successfully in 103 of 105 cases by the use of posterior pituitary injection of double the official (U. S. P.) strength. Side reactions were not serious.

The solution should not be used if the patient has heart disease, because of the decrease of flow in the coronary vessels.

HITSCHLER, Philadelphia.

Larynx

PARALYSIS OF LEFT VOCAL CORD FOLLOWING STREPTOMYCIN THERAPY. LAWRENCE K. GUNDRUM, J. A. M. A. **138**:22 (Sept. 4) 1948.

The author mentions the recent records of temporary and occasionally permanent injury to the vestibular and auditory portions of the eighth nerve following streptomycin therapy. He reports a case of a woman aged 33 who was receiving a suspension of the right kidney when roentgenologic examination revealed decided ptosis of the kidney. The patient received 11 Gm. of streptomycin and 2,000,000 units of penicillin intramuscularly for one week after the operation. Twelve days later she noticed a lump in her throat and had difficulty in swallowing liquids. Ten days thereafter hoarseness developed and examination showed complete paralysis of the left vocal cord. Her condition was otherwise normal. The patient was given large doses of a preparation of vitamin B complex and was seen at weekly intervals, with no improvement in the paralysis.

This report is presented to indicate the possibility of streptomycin's causing nerve injury because of the sensitivity of the nerve to the drug.

GORDON, Philadelphia.

SURGICAL TREATMENT OF PAPILLOMATOSIS OF THE LARYNX. JEAN DESPONS, Rev. de laryng. **69**:25 (Sept.-Oct.) 1948.

Despons prefers surgical treatment for diffuse papillomatosis rather than diathermocoagulation, radium or roentgen therapy, which have several drawbacks and do not assure a permanent cure. He is opposed to surgical treatment by natural approach, advising that laryngostomy and decortication of the laryngeal mucosa be performed, with complete removal of the papillomatous masses and electrocoagulation to insure hemostasis. The wound is filled with a "cigar" made of iodoform gauze, which is replaced in the following days by dilating rubber tubes; the latter are removed after one month, and the laryngostomy is closed. This technic, after Moure, Sargnon and Portman, secures a permanent result, in the author's opinion.

HERSON, Chicago.

Nose

ART IN THE NASAL PLASTIC OPERATION. L. M. PEARLMAN, Am. J. Surg. **74**:150 (Aug.) 1947.

As the title implies, the author reports on a group of operations in which each condition was corrected from the esthetic standpoint, rather than in accordance with any given rules of rhinoplasty, although the methods here employed were not notably different from those in routine use. Photographs in each case before and after operation give indication of the success of the procedures.

SELTZER, Philadelphia.

OPERATIVE TREATMENT OF OZENA. A. RÉTHI, J. Laryng. & Otol. **62**:139 (March) 1948.

The essential features of ozena—scab formation and hyperventilation of the nasal mucosa—and the former methods used for the alleviation and cure of this condition are briefly discussed.

A new type of operation which has been devised and used successfully by the author is described. A portion of the nasal septum is incised, fractured and bent in such a manner as to form a vertical obstruction which effectively blocks 90 per

cent of the air space in the nasal passages. The final stage of the operation is the unilateral transplantation of Stensen's duct into one maxillary sinus. This is unlike the operation of Wittmaack, who employed bilateral transplantation, thereby obtaining too much salivary secretion intranasally, a condition which proved annoying to the patient. The author states that unilateral transplantation of the duct provides just enough secretion to keep the nasal mucosa of both nostrils moist. Réthi has employed his operative procedure for the past five years, during which 26 patients have been operated on, and all are still enjoying complete relief from the discomforts of ozena. In the opinion of the abstracter, this would seem to be a fairly simple procedure, and one worthy of trial.

LeJeune and Steele, New Orleans.

Miscellaneous

The Future of Otolaryngology. John Mackenzie Brown, J. A. M. A. **135**:471 (Oct. 25) 1947.

The author, an outstanding otolaryngologist, discusses the future of the specialty in his characteristically lucid and fluent manner, with a sensitivity that reflects his well known sincerity.

The specialty of otolaryngology is ever progressing, and newer problems will be encountered, studied and mastered. Suppurative states in the sinuses and ear are now dealt with less radically than in former years, owing to the judicious use of chemotherapy, biotherapy and the fact that patients now seek attention much more promptly than before.

Functional studies of the acoustic mechanism have evolved fenestration surgery, which has been a boon to the patients whose deafness is a result of clinical otosclerosis. Surgical approach to the labyrinth, after the method of Day and Cawthorne, has been of help in certain instances of Ménière's disease. The use of radium in the nasopharynx in cases of conduction deafness and tubal obstruction has been of help.

Aviation otology and the proper management of conditions that arise with further advancements in air travel constitute another aspect of the specialty to be considered for the future. In the field of surgical rhinology, a more thorough grasp of the physiologic mechanism of the nose, sinuses and respiratory system, with related regard for allergic states and a revised understanding of the principles of immunology and well-being, will further aid in solving the various problems that are encountered.

The sphere of laryngology and bronchoesophagology has become a necessary part of the daily practice of every otolaryngologist. Improvements and advances in thoracic surgery have necessitated great cooperation between the thoracic surgeon and the laryngologist. Accordingly, this particular branch has become so highly specialized that some physicians have been forced to restrict their practice to this field alone.

The technic of application of radioactive materials, the use of nitrogen mustards (methyl-bis or tris [β-chloroethyl] amine hydrochloride), the administration of various isotopes and the ultimate use of the cyclotron against disease may become a part of medical practice.

The otolaryngologist of the future should be educated in fundamental technics of reconstructive plastic surgery, acoustic physics, bronchoesophagologic pro-

cedures, allergy, immunology and psychosomatic medicine, as well as in the basic principles of otolaryngology.

The American Board of Otolaryngology has done much to put this specialty on a high grade basis.

GORDON, Philadelphia.

CANCER OF THE HEAD AND NECK. HAYES MARTIN, J. A. M. A. **137**:1306 (Aug. 7) 1948.

This paper is a moderate discussion of cancer of the mouth, outlining the etiology, pathology, symptoms, morbid anatomy, clinical course, metastasis, diagnosis and differential diagnosis, biopsy, treatment, prognosis and end results. Several figures accompany the article, with a table showing the five year cure rates in cancer of the mouth and associated structures in the early as well as in the advanced cases.

Cancer of the nasopharynx and pharyngeal wall is discussed in the same manner. Cancer of the nasopharynx is highly anaplastic and extremely radiosensitive; the nasopharynx tolerates heavy doses of radiation. The best treatment is irradiation with fractional doses of roentgen rays supplemented with intracavity application of radium or radon. Radiation therapy is better than dissection of the neck, because of the widespread involvement of the cervical lymph nodes.

One picture demonstrates the simple method of obtaining a biopsy specimen by inserting an instrument through the nasal cavity and guarding its manipulation by a mirror inserted through the mouth. With cancer of the pharyngeal wall, the author prefers surgical intervention of one kind or another, since with the present improved postoperative care, better results are obtained than with irradiation alone. When the lesions are too far advanced, fractional doses of radiation supplemented with interstitial application of radium or radon is the method of choice.

GORDON, Philadelphia.

Directory of Otolaryngologic Societies *

INTERNATIONAL

Fourth International Congress of Otolaryngology

President: Dr. V. E. Negus, London, England.
General Secretaries: Dr. F. C. W. Capps and Dr. W. A. Mill, 45 Lincoln's Inn Fields, London, W. C. 2.
Place: London. Time: July 18-23, 1949.

Second Pan-American Congress of Oto-Rhino-Laryngology and Bronchoesophagology

President: Prof. Justo Alonso.
Secretary: Dr. Chevalier L. Jackson, 255 S. 17th St., Philadelphia 3.
Place: Montevideo. Time: January 1950.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Henry B. Orton, 224 Delavan Ave., Newark, N. J.
Secretary: Dr. J. Milton Robb, 1553 Woodward Ave., Detroit, Mich.
Place: Atlantic City, N. J. Time: June 6-10, 1949.

American Academy of Ophthalmology and Otolaryngology

President: Dr. Conrad Berens, 35 E. 70th St., New York.
President-Elect: Dr. J. Mackenzie Brown, 1136 W. 6th St., Los Angeles 14.
Executive Secretary-Treasurer: Dr. William L. Benedict, 100–1st Ave. Bldg., Rochester, Minn.

American Broncho-Esophagological Association

President: Dr. Paul Holinger, 700 N. Michigan Ave., Chicago 11.
Secretary: Dr. Edwin N. Broyles, 1100 N. Charles St., Baltimore.

American Laryngological Association

President: Dr. Ralph A. Fenton, 1020 S.W. Taylor St., Portland, Ore.
Secretary: Dr. Louis H. Clerf, 28 South Tenth Street, Philadelphia 7.

American Laryngological, Rhinological and Otological Society, Inc.

President: Dr. John J. Shea, 1018 Madison Ave., Memphis, Tenn.
Secretary: Dr. C. Stewart Nash, 708 Medical Arts Bldg., Rochester 7, N. Y.

SECTIONS:

Eastern.—Chairman: Dr. Harold G. Tobey, 403 Commonwealth Ave., Boston.
Southern.—Chairman: Dr. Watt W. Eagle, Duke University, Durham, N. C.
Middle.—Chairman: Dr. Dean M. Lierle, University Hospital, Iowa City.
Western.—Chairman: Dr. Leland G. Hunnicutt, 98 N. Madison Ave., Pasadena, Calif.

American Otological Society

President: Dr. Marvin F. Jones, 121 E. 60th St., New York.
Secretary: Dr. Gordon D. Hoople, Medical Arts Bldg., Syracuse 3, N. Y.

American Otorhinologic Society for the Advancement of Plastic and Reconstructive Surgery, Inc.

President: Dr. Samuel F. Kelley, 47 E. 61st St., New York 21.
Secretary: Dr. Norman N. Smith, 291 Whitney Ave., New Haven 11, Conn.

American Society of Ophthalmologic and Otolaryngologic Allergy

President: Dr. Rea E. Ashley, 384 Post St., San Francisco.
Secretary-Treasurer: Dr. Joseph Hampsey, 806 May Bldg., Pittsburgh 22.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

INDEX TO VOLUME 48

The asterisk (*) preceding the page number indicates an original article in the Archives. Subject entries are made for all articles. Author entries are made for original articles and society transactions. Book Reviews and Society Transactions are indexed under these headings in their alphabetical order under the letters B and S, respectively.

Abdeen, M. O.: Penicillin-sulfanilamide filling and primary suture in simple mastoidectomy, *332
Abnormalities and Deformities: See under names of organs and regions, as Esophagus; etc.
Abscess: See also under names of organs and regions, as Brain, abscess; etc.
brain abscess, subdural and extradural abscess, *600
Abu-Jaudeh, C. N.: Thrombophlebitis of cavernous sinus originating from acute dental infection; cure with penicillin, *36
Acid, Nicotinic: See Nicotinic Acid
Actinomycosis, bronchopulmonary, *720
Adenohypophysis: See Pituitary Body
Adenoids; control of post-tonsillectomy and post-adenoidectomy hemorrhage by double-strength posterior pituitary solution, 748
visualization and removal, 255
Adenoma; invasion of ethmoid sinuses by adenoma of pituitary gland; report of case, *187
of trachea, *733
Adipose Tissue: See Lipoma
Aerosols: See Penicillin; Streptomycin; etc.
Age, Old: See Old Age
Air; effects of negative air pressure in middle ear, 252
Air Passages: See Respiratory Tract
Allergy: See Anaphylaxis and Allergy
American Board of Otolaryngology, examinations, 259
American Medical Association; hearing aids accepted by Council on Physical Medicine as of Feb. 1, 1949, 367
Amygdalectomy: See Tonsillectomy
Anaphylaxis and Allergy: See also Asthma; etc.
allergic otitis media, *621
allergic sinusitis, *583
allergy in tropics, *712
allergy of eye, *695
anaphylactic shock, *712
bacterial allergy in relation to asthma, *145
case history in allergy, *714
heredity in allergy, *713
nasal allergy, *690
physical allergy of head, *694
review of allergy for 1946, *690
serum sickness, *711.
Anesthesia; control of muscle spasm and arthritic pain through sympathetic block at nasal ganglion and use of adenylic nucleotide, 137
in endoscopy, *715
in thoracic surgery with reference to surgery of esophagus, 374
induction with thiopental sodium in tonsillectomy, *238
Anesthetics: See Anesthesia
Angina: See Throat; Tonsils
Anomalies: See under names of organs and regions
Anson, B. J.: Stapes, fissula ante fenestram and associated structures in man; from fetus of 160 mm. (5 months) to newborn infant, *263
Antibiotics: See Streptomycin; etc.
Antiseptics: See Germicides
Antrum: See **Maxillary Sinus**
Anxiety: See Neuroses and Psychoneuroses
Aphasia, *is* is not verb for, 142
linguistic problems of brain-injured servicemen, 142
Apicitis: See Temporal Bone
Apparatus: See also Instruments
inhalation of penicillin dust, 375
lymphoid eustachian salpingitis; its effect on tubal patency; selective criteria for nasopharyngeal irradiation, *221
tracheotomy in poliomyelitis simplified with new respirator, *156
Aquaeductus Cochleae: See Temporal Bone
Arachnoid; arachnoiditis in fossa cranii posterior of otologic interest, 498
cystic arachnoiditis, *605
Arachnoiditis: See under Arachnoid
Armed Forces Personnel: See Military Medicine; etc.
Armies: See Military Medicine
Art in nasal plastic operation, 749
Arteries: See Blood vessels; Thrombosis; Vasomotor System; etc.
Arthritis; control of muscle spasm and arthritic pain through sympathetic block at nasal ganglion and use of adenylic nucleotide, 137
Articulation: See Speech
Arytenoidectomy: See under Larynx
Asthma, *697. See also Anaphylaxis and Allergy
bacterial allergy in relation to, *145
Atmosphere: See Air
Atopy: See Anaphylaxis and Allergy
Atresia: See under Esophagus
Audiogram: See Hearing, tests
Audiometry: See Hearing, tests
Audition: See Hearing
Auditory Organ: See Ear
Avitaminosis: See under Vitamins; and under names of deficiency diseases
Awards; Dr. Alfred Lewy receives award, 259

Bacilli: See Bacteria
Bacteria, Actinobacilli: See Actinomycosis
bacterial allergy in relation to asthma, *145
coli; meningitis due to Escherichia coli; streptomycin therapy, 139
Friedländer's, otogenous meningitis caused by, *615
glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
Influenza: See Influenza
pyocyaneus; meningitis treated with penicillin and streptomycin, 143
Bárány Test: See Labyrinth
Basilar Membrane: See Labyrinth
Becker, O. J.: Nasal fractures; analysis of 100 cases, *344
Bell's Paralysis: See Paralysis, facial
Biotherapy: See Otitis Media
Blast: See Explosions
Blood, proteins; gamma globulin in relation to infections of respiratory tract; experimental study of local use of gamma globulin in treatment of common cold, *527
vessels; origin of caloric reaction of labyrinth, *645
vessels; vascular disturbances of internal ear (cochlear branch), 254
Bones: See also under names of bones
Conduction: See Deafness; Hearing, tests
Diseases: See Osteomyelitis
estrogen, bone metabolism and otosclerosis, *637
plastic surgery of septum in conjunction with rhino-osteoplasty, *536

BOOK REVIEWS:
Diseases of Nose, Throat and Ear; W. L. Ballinger and others, 261
Handbook of Roentgen Diagnosis of Skull, Sinuses and Mastoids; B. R. Young, 260
Language and Language Disturbances; K. Goldstein, 747
Morell Mackenzie: Story of Victorian Tragedy; R. S. Stevenson, 377

Book Reviews—Continued
Rehabilitation of Speech: Textbook of Diagnostic and Corrective Procedures Based on Critical Study of Speech Disorders; R. West, L. Kennedy and A. Carr, 260
Brain: See also Dura Mater; etc.
abscess, otogenic, *618
abscess, subdural and extradural abscess, *600
Diseases: See Encephalitis
linguistic problems of brain-injured servicemen, 142
Bronchi; bronchogenic carcinoma; review of 316 cases, from 1937 to 1946, *552
bronchography in children, *726
bronchopulmonary actinomycosis, *720
calculi; broncholithiasis, *724
Diseases: See Bronchitis
lipoma of, *732
neoplasms of, *732
rupture of, *718
Spasm: See Asthma
tracheobronchial tuberculosis, 257
unusual pulmonary complications resulting from prolonged lodging of nonopaque foreign body in left main stem bronchus, *233
Bronchitis, mustard gas, *721
Bronchography: See under Bronchi
Broncholithiasis: See Bronchi, calculi
Bronchoscopy as aid in diagnosis of pulmonary disease, *718
Brown, E. A.: Glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
Bulla Ossea: See Ear, external
Burns, perforating, of tympanic membrane, *249
results of clinical and laboratory research, *89
total stenosis of esophagus due to lye burn, *83
Calcium and Calcium Compounds; estrogen, bone metabolism and otosclerosis, *637
Calculus: See Bronchi
Caloric Test: See Labyrinth
Campbell, E. H.: Analysis of results obtained in labyrinth fenestration operation for otosclerosis; report of 100 cases, *666
Cancer: See under names of organs and regions, as Esophagus; Larynx; Nasopharynx; Pharynx; etc.
Capillaries: See Blood vessels; Vasomotor System
Cardiovascular System: See Vasomotor System
Cartilage; choice of grafting material for plastic surgery, *88
plastic surgery of septum in conjunction with rhino-osteoplasty, *536
Case Records in allergy, *714
Cauldwell, E. W.: Stapes, fissula ante fenestram and associated structures in man; from fetus of 160 mm. (5 months) to newborn infant, *263
Cavernous Sinus: See Thrombophlebitis; Thrombosis
Cephalgia: See Headache
Cerebellopontile Angle; cystic arachnoiditis, *605
Cerebrospinal Fever: See Meningitis
Cerebrospinal Fluid; cerebrospinal rhinorrhea and repair of dural defects, *607
herpes zoster oticus ("Ramsay Hunt syndrome"); report of case, *1
Cerebrum: See Brain
Chase, W. D.: Solitary myeloma mistaken for frontal sinusitis, *244
Chemotherapy: See under names of diseases and chemotherapeutic agents, as Otitis Media; Penicillin; etc.
Chest: See Thorax
Children: See also Infants; Schools
bronchography in, *726
cleft lip and palate; some technical procedures used in its treatment with special reference to closure of complete cleft of anterior half of palate, *9
group pure tone hearing testing in public schools, 253
how parents and teachers can help prevent stuttering in, 257
Children—Continued
metropolitan speech correction, 141
p_H of nasal secretion in situ in infants and in children; effect of hyperventilation and crying, *67
prognosis in hard-of-hearing child, 748
relation of lesions of tongue in children to niacin deficiency, 502
rhinoplasty, with report of operation on 9 year old boy, *73
sinusitis in, *445
speech therapy for children with cerebral palsy, 138
Choanae: See Nose
Cigarets: See Tobacco
Circumvallate Papilla: See Tongue
Cleft Palate: See Palate
Clerf, L. H.: Peroral endoscopy; review of literature for 1947, *715
Cochlea: See Hearing; Labyrinth
Colds: See Respiratory Tract, diseases
Committee on Conservation of Hearing, report of, *463
Communicable Diseases: See Meningitis; etc.
Concussion: See Explosions
Constitution; influence of constitutional factors in otologic conditions, 134
vocal analysis, *171
Corti's Organ: See Labyrinth
Coryza: See Respiratory Tract, diseases; Rhinitis
Council on Physical Medicine of American Medical Association; hearing aids accepted as of Feb. 1, 1949, 367
Cox, G. H.: Incidence of congestion of larynx in men and women, *47
Cranium: See also Temporal Bone; etc.
brain abscess, subdural and extradural abscess, *600
cranio-facial-orbital wounds involving paranasal sinuses, *588
intracranial complications in otolaryngology, *597
intracranial complications of sinusitis, *435
plastic surgery of skull, *99
Crico-Arytenoid Joints: See under Larynx
Crying; p_H of nasal secretion in situ in infants and in children; effect of hyperventilation and crying, *67
Cysts: See under names of organs and regions, as Lungs; Maxillary Sinus; etc.

Deafness: See also Ear; Hearing; Otitis Media; Otosclerosis
analysis of results obtained in labyrinth fenestration operation for otosclerosis; report of 100 cases, *666
auditory nerve in multiple sclerosis, *51
conservation and rehabilitation, *487
effect of pregnancy on otosclerosis, *159
electrocoagulation of membranous labyrinth, 253
estrogen, bone metabolism and otosclerosis, *637
hearing aids, *494
hearing aids accepted by Council on Physical Medicine of American Medical Association as of Feb. 1, 1949, 367
occupation, *480
postoperative problems in cases of fenestration, 254
prevention by elimination of hypertrophied lymphoid tissue in nasopharynx by radium therapy, 372
prognosis in hard-of-hearing child, 748
surgical treatment of, 134
Tests: See Hearing, tests
Dentition: See Teeth
Dentures: See Teeth
Devine, K. D.: Tumors of nose and throat, *622
Diab, A. E.: Thrombophlebitis of cavernous sinus originating from acute dental infection; cure with penicillin, *36
Diathermy: See under names of diseases, organs and regions
Dickie, J. K. M.: Induction of anesthesia with thiopental sodium in tonsillectomy, *238
Diplacusis: See Deafness; Hearing
Diplegia: See Paralysis
Directory of otolaryngologic societies, 144, 262, 378, 506, 636, 748
Diverticulum: See Esophagus

Dizziness: See Vertigo
Drugs in treatment of sinusitis, *570
Dura Mater; cerebrospinal rhinorrhea and repair of dural defects, *607
Dysacusis: See Deafness
Dysart, B. B.: Otitis media and complications, *609
Dysphonia: See Voice

Ear: See also Deafness; Hearing; Otorhinolaryngology; and under names of special structures, i. e., Labyrinth; Mastoid; etc.
acoustic trauma, *480
arachnoiditis in fossa cranii posterior of otologic interest, 498
Discharge: See Otitis Media
Diseases: See Meningitis; Otitis Media; Otosclerosis; etc.
glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
influence of constitutional factors in otologic conditions, 134
Internal: See Labyrinth
Middle: See also Otitis Media; Vertigo, aural
middle, effects of negative air pressure in, 252
middle, in sound conduction, *19
middle; tumors of middle ear and mastoid portion of temporal bone, *626
ossicles; stapes, fissula ante fenestram and associated structures in man; from fetus of 160 mm. (5 months) to newborn infant, *263
repair of ear drum in blast injuries, 252
Sclerosis: See Otosclerosis
tuberculosis of ear, nose and throat treated with streptomycin; report of 12 cases, *209
tympanic membrane, perforating burn of, *249
tympanic membrane; suggested new anatomic classification of tympanic spaces and eustachian tube; draft of new clinical classification on this basis, *681
Edema: See also under names of organs and regions, as Larynx; etc.
cigaret smoke irritation; efficiency of filters in reducing its intensity, *41
Education, home study courses, 747
Electrocoagulation: See Labyrinth
Elfman, L. K.: Stevens-Johnson disease, *362
Embolism: See Thrombosis
Encephalitis, nonsuppurative, of otogenic origin, *618
Encephalomeningocele, intranasal, *606
Endoscopy: See also Bronchoscopy
peroral; review of literature for 1947, *715
Eosinophilis; eosinophilic lung, *719
Epidermis: See Skin
Epipharynx: See Nasopharynx
Equilibrium: See also Labyrinth; Nystagmus; etc.
Erich, J. B.: Laryngectomy; surgical technic which promotes rapid healing, *379
Erythema multiforme; Stevens-Johnson disease, *362
Escherichia: See Bacteria, coli
Esophagoscope, new, *688
Esophagus, anesthesia in thoracic surgery with reference to surgery of, 374
atresia of, *740
carcinoma of, *742
cicatricial stenosis, *741
diseases of, *740
esophageal intubation for repair of pharyngoesophageal diverticulum, 373
hemangioma of, *743
injuries, *740
leiomyoma of, *743
periesophagitis, *739
total stenosis due to lye burn, *83
tumors of, *633
varix of, *744
Estrogens, bone metabolism and otosclerosis, *637
Ethmoid Sinus: See also Sinuses. Nasal
ethmoiditis in adult, 138
invasion by adenoma of pituitary gland; report of case, *187
Ethmoiditis: See Ethmoid Sinus
Eustachian Tube; Bartolommeo Eustachio; great medical genius whose chief masterpiece remained hidden for 150 years, *58
lymphoid eustachian salpingitis; its effect on tubal patency; selective criteria for nasopharyngeal irradiation, *221
suggested new anatomic classification of tympanic spaces and eustachian tube; draft of new clinical classification on this basis, *681
Eustachio, Bartolommeo; great medical genius whose chief masterpiece remained hidden for 150 years, *58
Explosions; repair of ear drum in blast injuries, 252
Eyes: See also Orbit
allergy of, *695
ophthalmic conditions referable to diseases of paranasal sinuses, *202
orbital and ocular complications of sinusitis, *441

Fabricant, N. D.: p_H of nasal secretion in situ in infants and in children; effect of hyperventilation and crying, *67
Face, Abnormalities: See Harelip
cranio-facial-orbital wounds involving paranasal sinuses, *588
Paralysis: See Paralysis, facial
plastic surgery of, *99
Factories: See Industrial Diseases
Faier, S. Z.: Treatment of chronic sinusitis with penicillin, *507
Falsetto: See under Voice
Falx Cerebri: See Dura Mater
Farrior, J. B.: Lymphoid eustachian salpingitis; its effect on tubal patency; selective criteria for nasopharyngeal irradiation, *221
Fatigue, Auditory: See Hearing
Fenestration: See Deafness; Otosclerosis
Fetus: See also Pregnancy
stapes, fissula ante fenestram and associated structures in man; from fetus of 160 mm. (5 months) to newborn infant, *263
Fever, Cerebrospinal: See Meningitis
Stevens-Johnson disease, *362
Filters; cigaret smoke irritation; efficiency of filters in reducing its intensity, *41
Finnegan, J. K.: Cigaret smoke irritation; efficiency of filters in reducing its intensity, *41
Fischer, A. J.: Necrosis within pterygopalatine fossa; operation and recovery, *337
Fischer, N. A.: Necrosis within pterygopalatine fossa; operation and recovery, *337
Fissula Ante Fenestram: See Otosclerosis
Fluoroscopy: See Roentgen Rays
Foreign Bodies; biplane fluoroscopy, *736
cranio-facial-orbital wounds involving paranasal sinuses, *588
in air and food passages, *737
unusual pulmonary complications resulting from prolonged lodging of nonopaque foreign body in left main stem bronchus, *233
Fossa, Infratemporal: See Temporal Bone
Mandibular: See Jaws
Pterygomaxillary: See Jaws
Fowler, E. P.: Estrogen, bone metabolism and otosclerosis, *637
Fox, C. C.: Carcinoma of nasopharynx, *390
Fractures: See Nose
Freud, E. D.: Speech therapy; experiences with patients who had undergone total laryngectomy, *150
Friedlaender's Bacillus: See under Bacteria
Frontal Sinus: See also Sinuses, Nasal
solitary myeloma mistaken for frontal sinusitis, *244
Fungi: See Actinomycosis; etc.
Furlong, T. F., Jr.: Clinical test of new spray, *658

Galvanic Test: See Labyrinth
Gamma Globulin: See Blood, proteins
Ganglion; herpes zoster oticus ("Ramsay Hunt syndrome"); report of case, *1
Sphenopalatine: See Meckel's Ganglion
Gas, poisoning; mustard gas bronchitis, *721
Gastric Ulcer: See Peptic Ulcer
Gastroscopy: See Stomach
Geriatrics: See Old Age

Germicides; glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
Globulin: See Blood, proteins
Glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
Goodyear, H. M.: Ophthalmic conditions referable to diseases of paranasal sinuses, *202
Gould, J. W.: Tuberculosis of ear, nose and throat treated with streptomycin; report of 12 cases, *209
Graduate Work: See Education
Grafts: See Plastic Surgery; Skin; etc.
Greif, J. L.: Tuberculosis of ear, nose and throat treated with streptomycin; report of 12 cases, *209
Grip: See Influenza

Haag, H. B.: Cigaret smoke irritation; efficiency of filters in reducing its intensity, *41
Haemophilus Influenzae: See Influenza
Harbert, F.: Tubular wax splints in submucous resection; report of 150 cases, *662
Harelip; cleft lip and palate; some technical procedures used in its treatment with especial reference to closure of complete cleft of anterior half of palate, *9
  operation in treating secondary harelip deformities and defects of upper lip resulting from cancer, 504
Havens, F. Z.: Cleft lip and palate; some technical procedures used in its treatment with especial reference to closure of complete cleft of anterior half of palate, *9
Hay Fever: See Anaphylaxis and Allergy; Rhinitis, vasomotor
Head: See also Cranium
  cancer of head and neck, 751
  Injuries: See under Brain; etc.
  physical allergy of, *694
Headache, *694
  some present-day concepts of, 257
Hearing: See also Deafness
  Aids: See under Deafness
  Conservation: See also under Deafness
  conservation and rehabilitation, *487
  effects of negative air pressure in middle ear, 252
  functional examination of, *463
  group pure tone hearing testing in public schools, 253
  neurophysiologic clues to auditory acuity, 372
  tests; speech reception in relation to pattern of pure tone loss, 140
Heine-Medin Disease: See Poliomyelitis
Hemangioma of esophagus, *743
Hematology: See Blood
Hemophilus Influenzae: See Influenza
Hemorrhage: See also Nose, hemorrhage; Tonsillectomy; etc.
  control of post-tonsillectomy and post-adenoidectomy hemorrhage by double-strength posterior pituitary solution, 748
Henry, M.: New esophagoscope, *688
Heredity in allergy, *713
Hernia, hiatal, *744
Herpes zoster oticus (Ramsay Hunt syndrome); report of case, *1
Histamine: See also Anaphylaxis and Allergy antihistamine substances, *701
Hitschler, W. J.: Gamma globulin in relation to infections of respiratory tract; experimental study of local use of gamma globulin in treatment of common cold, *527
Holyoke, E. A.: Review of allergy for 1946, *690
Horton, B. T.: Auditory nerve in multiple sclerosis, *51
House, L. R.: Benign cysts of superior maxilla with special reference to cysts of maxillary sinus; clinicopathologic study of 30 cases, *301
Hunt Syndrome: See Herpes zoster
Hydrogen peroxide; glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
Hydrogen Ion Concentration; p_H of nasal secretion in situ in infants and in children; effect of hyperventilation and crying, *67
Hypertrophy: See under names of organs and regions
Hyperventilation: See Respiration
Hypnosis in system of therapy for stutterers, 140
Hypoacusia: See Deafness
Hypopharynx: See Larynx; Pharynx
Hypophysis: See Pituitary Body

Idiosyncrasy: See Anaphylaxis and Allergy
Immunity: See Anaphylaxis and Allergy; etc.
Incus: See Ear, ossicles
Indians, American; why Indian does not stutter, 504
Industrial Diseases; occupational deafness, *480
Infantile Paralysis: See Poliomyelitis
Infants: See also Children
  cleft lip and palate; some technical procedures used in its treatment with especial reference to closure of complete cleft of anterior half of palate, *9
  infant speech; vowel and consonant frequency, 141
  newborn; stapes, fissula ante fenestram and associated structures in man, from fetus of 160 mm. (5 months) to newborn infant, *263
  p_H of nasal secretion in situ in infants and in children; effect of hyperventilation and crying, *67
  type-token ratio applied to infant sounds, 141
Influenza; Hemophilus influenza meningitis treated with streptomycin, 139
Inhalation: See under Penicillin
Injuries: See under names of organs and regions, as Brain; Ear; Esophagus; etc.
Instruments: See also Apparatus
  clinical test of new spray, *658
  new esophagoscope, *688
Irradiation: See Larynx; Roentgen Rays; etc.

Jaws; necrosis within pterygopalatine fossa; operation and recovery, *337
  benign cysts of superior maxilla with special reference to cysts of maxillary sinus; clinicopathologic study of 30 cases, *301
  plastic surgery of, *99
Johnson, L.: Herpes zoster oticus ("Ramsay Hunt syndrome"); report of case, *1
Jongkees, L. B. W.: Origin of caloric reaction of labyrinth, *645
  Value of caloric test of labyrinth, *402

Karatay, S.: Total stenosis of esophagus due to lye burn, *83
Krabek, W.: Glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
Kulvin, M. M.: Bronchogenic carcinoma; review of 316 cases, from 1937 to 1946, *552

Labyrinth: See also Nystagmus; Vertigo, aural
  arachnoiditis in fossa cranii posterior of otologic interest, 498
  electrocoagulation of membranous labyrinth, 253
  Fenestration: See Otosclerosis
  labyrinthitis, *617
  origin of caloric reaction of, *645
  value of caloric test of, *402
  vascular disturbances of internal ear (cochlear branch), 254
Labyrinthitis: See under Labyrinth
Lamont, E. S.: Plastic surgery of septum in conjunction with rhino-osteoplasty, *536
Larson, P. S.: Cigaret smoke irritation; efficiency of filters in reducing its intensity, *41

Laryngectomy: See under Larynx
Laryngitis: See under Larynx
Laryngofissure: See under Larynx
Laryngology: See also Otorhinolaryngology
vocal analysis, *171
voice reeducation, *521
Laryngotracheobronchitis: See Respiratory Tract, diseases
Larynx, cancer and its treatment by radium, 501
carcinoma of, 256
edema in epidemic parotitis, 255
evolution of intubation, 136
incidence of congestion in men and women, *47
laryngectomy; surgical technic which promotes rapid healing, *379
paralysis of left vocal cord following streptomycin therapy, 749
present concepts of laryngeal disease, 501
speech therapy; experiences with patients who had undergone total laryngectomy, *150
surgical treatment of base of tongue by translaryngeal approach, 136
surgical treatment of papilliomatosis of, 749
treatment of carcinoma of pharynx and larynx, 256
tuberculosis of, *209
tumors of, *628
Lateral Sinus, Thrombosis: See Thrombosis
Lawrence, M.: Middle ear in sound conduction, *19
Lefkon, I. M.: Rhinoplasty in children with report of operation on 9 year boy, *73
Leiomyoma of esophagus, *743
Leshin, N.: Functional examination of hearing, *463
Lewy, A.: Functional examination of hearing, *463
receives award, 259
Lindsay, J. R.: Intracranial complications in otolaryngology, *597
Lip Reading: See under Deafness
Lipoma of bronchus, *732
Lips: See also Harelip
operation in treating secondary harelip deformities and defects of upper lip resulting from cancer, 504
Lithiasis: See Bronchi, calculi
Lobectomy: See Lungs
Lundon, A. E.: Streptomycin by topical application in treatment of chronic suppurative otitis media, *418
Lungs: See also Bronchi; Respiration; Respiratory Tract; Thorax; etc.
aplasia, *718
bronchogenic carcinoma, *734
bronchopulmonary actinomycosis, *720
bronchoscopy as aid in diagnosis of pulmonary disease, *718
cyst, *736
eosinophilic, *719
penicillin in bronchopulmonary infection, *727
Tuberculosis: See Tuberculosis, pulmonary
unusual pulmonary complications resulting from prolonged lodging of nonopaque foreign body in left main stem bronchus, *233
Lye; total stenosis of esophagus due to lye burn, *83
Lymphocytes; herpes zoster oticus ("Ramsay Hunt syndrome"); report of case, *1
Lymphoid Tissue: See also Adenoids; Nasopharynx; Tonsils; etc.
lymphoid eustachian salpingitis; its effect on tubal patency; selective criteria for nasopharyngeal irradiation, *221
prevention of deafness by elimination of hypertrophied lymphoid tissue in nasopharynx by radium therapy, 372

MacQuiddy, E. L.: Review of allergy for 1946, *690
Maliniac, J. W.: Role of septum in rhinoplasty, *189
Malleus: See Ear, ossicles
Mandible: See Jaws
Mastoid, Inflammation: See Mastoiditis
surgery; penicillin-sulfanilamide filling and primary suture in simple mastoidectomy, *332
tuberculosis of mastoid processes, *216
tumors of middle ear and mastoid portion of temporal bone, *626
Mastoidectomy: See Mastoid, surgery
Mastoiditis: See also Otitis Media
acute, masked by penicillin therapy, *614
and acute otitis media, *612
and chronic otitis media, *613
Maxilla: See Jaws
Maxillary Bone: See Jaws
Maxillary Sinus: See also Sinuses, Nasal
and dental disease, *586
benign cysts of superior maxilla with special reference to cysts of maxillary sinus; clinicopathologic study of 30 cases, *301
Meckel's Ganglion; control of muscle spasm and arthritic pain through sympathetic block at nasal ganglion and use of adenylic nucleotide, 137
Medicine, Military: See Military Medicine
Medin-Heine Disease: See Poliomyelitis
Membrane, Tympanic: See Ear, tympanic membrane
Ménière's Disease: See Vertigo, aural
Meninges: See Arachnoid; Dura Mater; etc.
Meningitis, *597, *616
complications of acute otitic meningitis, 748
due to Escherichia coli; streptomycin therapy, 139
Hemophilus influenza meningitis treated with streptomycin, 139
otogenous, caused by Friedländer's bacillus, *615
treated with penicillin and streptomycin, 143
Meningococci: See under Meningitis
Military Medicine; acute injuries to neck involving food and air passages, 256
allergy in tropics, *712
linguistic problems of brain-injured servicemen, 142
Moses, P. J.: Vocal analysis, *171
Mouth; cancer of head and neck, 751
Mucous Membrane: See Nose; etc.
Mumps: See Parotitis
Muscles, Paralysis: See Paralysis
Mustard Gas: See Gas, poisoning
Mycosis: See Actinomycosis; etc.
Myeloma, solitary, mistaken for frontal sinusitis, *244
Myocardium: See Heart

Narcosis: See Anesthesia
Nares: See Nose
Nasal Sinuses: See Sinuses, Nasal
Nasality: See Speech
Nasopharynx, carcinoma of, *390
lymphoid eustachian salpingitis; its effect on tubal patency; selective criteria for nasopharyngeal irradiation, *221
prevention of deafness by elimination of hypertrophied lymphoid tissue in nasopharynx by radium therapy, 372
tumors of, *624
Neck; acute injuries to neck involving food and air passages, 256
cancer of head and neck, 751
Necrosis within pterygopalatine fossa; operation and recovery, *337
Neoplasms: See under names of organs and regions
Nerves: See also Paralysis
auditory, in multiple sclerosis, *51
Nervous System: See Brain; Nerves; etc.
New, G. B.: Tumors of nose and throat, *622
Newborn Infants: See Infants, newborn
Niacin: See Nicotinic Acid
Nicotinic Acid; relation of lesions of tongue in children to niacin deficiency, 502
Noise: See also Explosions
acoustic trauma, *480
Nose: See also Nasopharynx; Otorhinolaryngology; etc.
Accessory Sinuses: See Sinuses, Nasal
art in nasal plastic operation, 749
bifid, *88
clinical test of new spray, *658
discharge; cerebrospinal rhinorrhea and repair of dural defects, *607
fractures; analysis of 100 cases, *344
Inflammation: See Rhinitis
intranasal encephalomeningocele, *606
nasal allergy, *690
p_H of nasal secretion in situ in infants and in children; effect of hyperventilation and crying, *67
plastic surgery of, *112
plastic surgery of septum in conjunction with rhino-osteoplasty, *536

Nose—Continued
potentialities and limitations of corrective rhinoplasty, 376
rhinology in children; résumé of and comments on literature for 1947, 374
rhinoplasty, *112
rhinoplasty in children with report of operation on 9 year old boy, *73
role of septum in rhinoplasty, *189
supporting function of septal cartilage in plastic surgery, *86
surgery, use of thrombin in, 138
tuberculosis of ear, nose and throat treated with streptomycin; report of 12 cases, *209
tubular wax splints in submucous resection; report of 150 cases, *662
tumors of nose and throat, *622
Nov-Ovalis: See Otosclerosis
Nucleotide: See Spasm
Nutrition in ophthalmology and otolaryngology, 503
Nystagmus: See also Labyrinth
origin of caloric reaction of labyrinth, *645
value of caloric test of labyrinth, *402

Occupational Diseases: See Industrial Diseases
O'Connor, T. P.: Bacterial allergy in relation to asthma, *145
O'Keefe, J. J.: Peroral endoscopy; review of literature for 1947, *715
Old Age; vascular disturbances of internal ear (cochlear branch), 254
Oliver, K. S.: Thrombophlebitis of cavernous sinus originating from acute dental infection; cure with penicillin, *36
Ophthalmia; Stevens-Johnson disease, *362
Ophthalmology; nutrition in ophthalmology and otolaryngology, 503
Orbit; cranio-facial-orbital wounds involving paranasal sinuses, *588
orbital and ocular complications of sinusitis, *441
Organ of Corti: See Labyrinth
Oropharynx: See Pharynx
Orthodontia: See Jaws; Teeth
Ossicles: See Ear
Osteomyelitis, *599
Osteoplasty: See under Bones
Otitis Media: See also Mastoiditis
acute, and mastoiditis, *612
allergic, *621
and complications, *609
and facial paralysis, *619
brain abscess, otogenic, *618
chemotherapy and biotherapy, *609
chronic, and mastoiditis, *613
chronic suppurative; streptomycin by topical application in treatment, *418
complications of acute otitic meningitis, 748
nonsuppurative encephalitis of otogenic origin, *618
otogenous meningitis caused by Friedländer's bacillus, *615
Oto-Audion: See Hearing, tests
Otolaryngologic societies, directory of, 144, 262, 378, 506, 636, 748
Otolaryngology: See also Otorhinolaryngology
future of, 750
intracranial complications in, *597
nutrition in ophthalmology and otolaryngology, 503
Otoliths; origin of caloric reaction of labyrinth, *645
Otology: See Otorhinolaryngology
Otorhinolaryngology: See also Laryngology; Otolaryngology
history; Bartolommeo Eustachio, great medical genius whose chief masterpiece remained hidden for 150 years, *58
Otorrhea: See Otitis Media
Otosclerosis; analysis of results obtained in labyrinth fenestration operation; report of 100 cases, *666
effect of pregnancy on, *159
estrogen and bone metabolism, *637
postoperative problems in cases of fenestration, 254
some remarks on fenestration operation and what leads to results, 135
surgical treatment of deafness, 134
Oxygen: See Respiration
Ozena: See Rhinitis

Pacchionian Body: See Arachnoid
Palate; cleft lip and palate; some technical procedures used in its treatment with especial reference to closure of complete cleft of anterior half of palate, *9
plastic surgery of, *99
Palsy: See Paralysis
Pansinusitis: See Sinuses, Nasal
Papilla, Circumvallate: See Tongue
Papilloma; surgical treatment of papillomatosis of larynx, 749
Paralysis. See also Poliomyelitis; etc.
cerebral, speech therapy for children with, 138
facial, and otitis media, *619
facial; herpes zoster oticus ("Ramsay Hunt syndrome"); report of case, *1
Infantile: See Poliomyelitis
Laryngeal: See under Larynx
Parents; how parents and teachers can help prevent stuttering in children, 257
Paresis: See Paralysis
Parietal Lobe: See Brain
Parotitis, epidemic, laryngeal edema in, 255
Past Pointing: See Labyrinth
Patch Test: See Anaphylaxis and Allergy
Peer, L. A.: Contributions to plastic surgery during 1946, *86
Penicillin; inhalation of penicillin dust, 375
massive local infiltration in surgical conditions, 504
Therapy: See also Mastoid, surgery; Meningitis; Sinuses, Nasal; Thrombophlebitis; etc.
therapy, acute mastoiditis masked by, *614
treatment, tissue changes in sinus membranes after, 502
Penta, A. Q.: Unusual pulmonary complications resulting from prolonged lodging of nonopaque foreign body in left main stem bronchus, *233
Pentothal Sodium®: See Anesthesia
Peristein, M. A.: p_H of nasal secretion in situ in infants and in children; effect of hyperventilation and crying, *67
Personality; vocal analysis, *171
Peterson, R. L.: Tracheotomy in poliomyelitis simplified with new respirator, *156
Petrositis: See Temporal Bone
Petrous Bone: See Temporal Bone
Pfeiffer's Bacillus: See Influenza
p_H: See Hydrogen Ion Concentration
Phagocytes and Phagocytosis; tissue changes in sinus membranes after penicillin treatment, 502
Pharynx: See also Nasopharynx
esophageal intubation for repair of pharyngo-esophageal diverticulum, 373
treatment of carcinoma of pharynx and larynx, 256
tuberculosis of, *213
tumors of tonsil and pharynx, *627
Phonation: See Speech; Voice
Phonetics: See under Speech; Voice
Pituitary Body, invasion of ethmoid sinuses by adenoma of; report of case, *187
Pituitary Preparations; control of post-tonsillectomy and post-adenoidectomy hemorrhage by double-strength posterior pituitary solution, 748
Plasma: See Blood
Plastic Surgery: See also under Nose; etc.
art in nasal plastic operation, 749
choice of grafting material, *88
cleft lip and palate; some technical procedures used in its treatment with especial reference to closure of complete cleft of anterior half of palate, *9
contributions during 1946, *86
of septum in conjunction with rhino-osteoplasty, *536
potentialities and limitations of corrective rhinoplasty, 376
results of clinical and laboratory research, *89
rhinoplasty in children with report of operation on 9 year boy, *73
role of septum in rhinoplasty, *189
skin grafting, *96
supporting function of septal cartilage in, *86
Poisons and Poisoning: See under names of specific substances, as Lye; etc.

Poliomyelitis, respiratory complications of, *721
tracheotomy simplified with new respirator, *156
Polyp: See Stomach
Postgraduate Education: See Education
Pregnancy: See also Fetus
effect on otosclerosis, *159
Premaxilla: See Harelip
Presbycusis: See Deafness
Proctor, D. F.: Invasion of ethmoid sinuses by adenoma of pituitary gland; report of case, *187
Prostheses: See Plastic Surgery
Psychoanalysis; vocal analysis, *171
Pterygomaxillary Space: See Jaws
Puerner, J. W.: Perforating burn of tympanic membrane, *249
Putney, F. J.: Peroral endoscopy; review of literature for 1947, *715

Radiations: See Roentgen Rays; under names of various organs and diseases, as Larynx; Nasopharynx; etc.
Radium, Therapy: See under names of various organs, regions and diseases, as Larynx, cancer; Nasopharynx; etc.
Reagins: See Anaphylaxis and Allergy
Reconditioning: See Rehabilitation
Recruits: See Military Medicine
Rehabilitation and conservation of hearing, *487
linguistic problems of brain-injured servicemen, 142
Research; results of clinical and laboratory research, *89
Respiration, artificial; tracheotomy in poliomyelitis simplified with new respirator, *156
complications of poliomyelitis, *721
p_H of nasal secretion in situ in infants and in children; effect of hyperventilation and crying, *67
Respirator: See Respiration, artificial
Respiratory Tract; See also Bronchi; Nasopharynx; Nose; Pharynx; etc.
acute injuries to neck involving food and air passages, 256
bacterial allergy in relation to asthma, *145
diseases; clinical test of new spray, *658
diseases; gamma globulin in relation to infections of respiratory tract; experimental study of local use of gamma globulin in treatment of common cold, *527
diseases; laryngotracheobronchitis, *725
foreign bodies in air and food passages, *737
heredity in allergy, *713
inhalation of penicillin dust, 375
viral infections of; their treatment and prevention, 139
Rhinitis: See also Respiratory Tract, diseases
operative treatment of ozena, 749
perennial vasomotor; modern approach to diagnosis and treatment, 143
Rhinology: See Otorhinolaryngology
Rhinopharynx: See Nasopharynx
Rhinoplasty: See under Nose
Rhinoscleroma; scleroma, *720
Roentgen Rays; biplane fluoroscopy, *736
Rutberg, F. L.: Gamma globulin in relation to infections of respiratory tract; experimental study of local use of gamma globulin in treatment of common cold, *527

Salinger, S.: Paranasal sinuses, *430, *564
Salivary Glands, aberrant, tissue in tonsillar fossa, 255
Salpingitis: See Eustachian Tubes
Scala Tympani: See Labyrinth
Schiff, M.: Tubular wax splints in submucous resection; report of 150 cases, *662
Schools; how parents and teachers can help prevent stuttering in children, 257
metropolitan speech correction, 141
public, group pure tone hearing testing in, 253
Schuknecht, H. F.: Intracranial complications in otolaryngology, *597
Schwarzbart, A.: Suggested new anatomic classification of tympanic spaces and eustachian tube; draft of new clinical classification on this basis, *681
Scleroma: See Rhinoscleroma
Sclerosis, multiple, auditory nerve in, *51
Semicircular Canal: See Labyrinth
Senility: See Old Age
Septicemia: See under specific organisms
Septum, Nasal: See Nose
Serum Sickness: See Anaphylaxis and Allergy
Sex; incidence of congestion of larynx in men and women, *47
Shapiro, S. L.: Functional examination of hearing, *463
Shrapnell's Membrane: See Ear, tympanic membrane
Sinus, Ethmoid: See Ethmoid Sinus
Frontal: See Frontal Sinus
Maxillary: See Maxillary Sinus
Nasal: See Sinuses, Nasal
Thrombosis: See under Thrombosis
Sinuses, Nasal: See also Ethmoid Sinus; Frontal Sinus; Maxillary Sinus; etc.
allergic sinusitis, *583
cranio-facial-orbital wounds involving paranasal sinuses, *588
drugs in treatment of sinusitis, *570
intracranial complications of sinusitis, *435
malignant tumors, *450
nonmalignant tumors, *453
nonsurgical therapy of sinusitis, *567
ophthalmic conditions referable to diseases of paranasal sinuses, *202
orbital and ocular complications of sinusitis, *441
paranasal sinuses, *430, *564
sinusitis in children, *445
solitary myeloma mistaken for frontal sinusitis, *244
surgical treatment of sinusitis, *564
tissue changes in sinus membranes after penicillin treatment, 502
treatment of chronic sinusitis with penicillin, *507
Skeleton: See Bones
Skiffington, R.: Glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
Skin grafting, *96
neurophysiologic clues to auditory acuity, 372
Skull: See Cranium
Smith, H. W.: Effect of pregnancy on otosclerosis, *159
Smith, K. R.: Middle ear in sound conduction, *19
Smoke: See Tobacco
Societies, Central Illinois Society of Ophthalmology and Otolaryngology, 259
international, directory of, 144, 262, 378, 506, 636, 748
national, directory of, 144, 262, 378, 506, 636, 748
otolaryngologic, directory of, 144, 262, 378, 506, 636, 748
Sounds: See also Noise
effects of negative air pressure in middle ear, 252
middle ear in sound conduction, *19
type-token ratio applied to infant sounds, 141
Spasm; control of muscle spasm and arthritic pain through sympathetic block at nasal ganglion and use of adenylic nucleotide, 137
Speech: See also Aphasia; Voice
how parents and teachers can help prevent stuttering in children, 257
hypnosis in system of therapy for stutterers, 140
infant; vowel and consonant frequency, 141
linguistic problems of brain-injured servicemen, 142
metropolitan correction, 141
reception in relation to pattern of pure tone loss, 140
therapy; experiences with patients who had undergone total laryngectomy, *150
therapy for children with cerebral palsy, 138
why Indian does not stutter, 504
why stammerers suffer, 503

Sphenopalatine Ganglion: See Meckel's Ganglion
Spinal Fluid: See Cerebrospinal Fluid
Splints; tubular wax splints in submucous resection; report of 150 cases, *662
Spray, new, clinical test of, *658
Stammering: See under Speech
Stapes: See Ear, ossicles
Status Asthmaticus: See Asthma
Stenosis: See Esophagus
Stevens-Johnson Disease: See Erythema multiforme
Stokes, J., Jr.: Gamma globulin in relation to infections of respiratory tract; experimental study of local use of gamma globulin in treatment of common cold, *527
Stomach; gastric varices, *746
gastroscopy, *745
polyps, *746
Stomatitis; Stevens-Johnson disease, *362
Streptomycin by topical application in treatment of chronic suppurative otitis media, *418
Therapy: See also Meningitis; etc.
therapy, paralysis of left vocal cord following, 749
Stria Vascularis: See Labyrinth
Stuttering: See Speech, defects
Styloid Process: See Temporal Bone
Subarachnoid Space: See Meninges
Sublingual Glands: See Salivary Glands
Sulfanilamide, Therapy: See Mastoid, surgery
Surgery: See also Apparatus; Instruments
massive local infiltration of penicillin in surgical conditions, 504
Plastic: See Plastic Surgery
postoperative problems in cases of fenestration, 254
Sutures; penicillin-sulfanilamide filling and primary suture in simple mastoidectomy, *332
Syphilis: See under names of organs and regions

Teachers; how parents and teachers can help prevent stuttering in children, 257
Teeth; benign cysts of superior maxilla with special reference to cysts of maxillary sinus; clinicopathologic study of 30 cases, *301
caries; Stevens-Johnson disease, *362
dental disease and maxillary sinus, *586
thrombophlebitis of cavernous sinus originating from acute dental infection; cure with penicillin, *36
Temperature; origin of caloric reaction of labyrinth, *645
Temporal Bone; stapes, fissula ante fenestram and associated structures in man; from fetus of 160 mm. (5 months) to newborn infant, *263
Temporomandibular Joint: See Jaws
Thiopental Sodium: See Anesthesia
Thorax: See also Heart; Lungs; etc.
anesthesia in thoracic surgery with reference to surgery of esophagus, 374
Throat: See also Larynx; Otorhinolaryngology; Pharynx; Tonsils; etc.
tuberculosis of ear, nose and throat treated with streptomycin; report of 12 cases, *209
tumors of nose and throat, *622
Thrombin; use in nasal surgery, 138
Thrombophlebitis of cavernous sinus originating from acute dental infection; cure with penicillin, *36
Thrombosis: See also Thrombophlebitis
acute mastoiditis masked by penicillin therapy, *614
lateral sinus thrombosis, *615
sinus, *604
Tobacco; cigaret smoke irritation; efficiency of filters in reducing its intensity, *41
Tones; speech reception in relation to pattern of pure tone loss, 140
Tongue; relation of lesions of tongue in children to niacin deficiency, 502
surgical treatment of base by translaryngeal approach, 136
Tonsillectomy, control of post-tonsillectomy and post-adenoidectomy hemorrhage by double-strength posterior pituitary solution, 748
induction of anesthesia with thiopental sodium in, *238
Tonsillitis: See Tonsillectomy
Tonsils; aberrant salivary tissue in tonsillar fossa, 255
Pharyngeal: See Adenoids
tumors of tonsil and pharynx, *627
Trachea, adenoma of, *733
neoplasms of, *732
tracheobronchial tuberculosis, 257
tumors of, *631
Tracheobronchitis, tuberculous, *723
Tracheotomy in poliomyelitis simplified with new respirator, *156
Transplantation: See under Plastic Surgery; etc.
Tropics, allergy in, *712
Tuberculosis: See also under names of organs, regions and diseases, as Bronchi; Ear; Larynx; Mastoid; Nose; Pharynx; Tracheobronchitis; etc.
pulmonary; incidence of congestion of larynx in men and women, *47
tracheobronchial, 257
Tumors: See Adenoma; Chordoma; Ganglioneuroma; Hemangioma; Leiomyoma; Lipoma; Myeloma; etc.; and under names of organs and regions, as Bronchi; Ear; Esophagus; Larynx; Mastoid; Nasopharynx; Nose; etc.
Tuning Forks: See Hearing, tests
Turbinates: See under Nose
Tympanic Membrane: See under Ear
Tympanomastoidectomy: See Otosclerosis

Ulcers, Peptic: See Peptic Ulcer
Urea; glycerite of hydrogen peroxide with urea; comparison by in vitro methods of its bacteriotoxic action with that of 3 proprietary aural preparations, *327
Utriculo-Endolymphatic Valve: See Labyrinth

Van Duyn, J.: Contributions to plastic surgery during 1946, *86
Varix: See Esophagus; Stomach
Vasomotor System: See also Blood vessels
clinical test of new spray, *658
some remarks on fenestration operation and what leads to results, 135
Veins: See Blood vessels; Thrombophlebitis; Thrombosis; Vasomotor System
Varicose: See Esophagus; Stomach
Vertigo, Aural; Ménière's syndrome, *694
herpes zoster oticus ("Ramsay Hunt syndrome"); report of case, *1
Vestibular Apparatus: See Ear; Labyrinth
Viruses: See also Herpes; Poliomyelitis; etc.
viral infections of repiratory tract; their treatment and prevention, 139
Vitamins: See also Nicotinic Acid; etc.
nutrition in ophthalmology and otolaryngology, 503
Vocal Cords: See Larynx; Voice
Voice reeducation, *521
vocal analysis, *171
Von Leden, H.: Auditory nerve in multiple sclerosis, *51
Waldeyer Ring: See Tonsils
War: See Military Medicine; etc.
Ward, B. C.: Tracheotomy in poliomyelitis simplified with new respirator, *156
Wax; tubular wax splints in submucous resection; report of 150 cases, *662
Wells, W. A.: Bartolommeo Eustachio; great medical genius whose chief masterpiece remained hidden for 150 years, *58
Wever, E. G.: Middle ear in sound conduction, *19
Wever-Bray Phenomenon: See Labyrinth
Word Deafness: See Aphasia
Wounds: See Military Medicine

X-Rays: See Roentgen Rays

Zerffi, W. A. C.: Voice reeducation, *521
Zona: See Herpes zoster
Zonderman, B.: Herpes zoster oticus ("Ramsay Hunt syndrome"); report of case, *1

THE ARCHIVES OF OTOLARYNGOLOGY is published by the American Medical Association to stimulate research in the field of otology and laryngology and to disseminate knowledge in this department of medicine.

Manuscripts for publication, books for review and correspondence relating to the editorial management should be sent to Dr. George M. Coates, Chief Editor, 1721 Pine Street, Philadelphia 3, or to any other member of the Editorial Board. Communications regarding subscriptions, reprints, etc., should be addressed, ARCHIVES OF OTOLARYNGOLOGY, American Medical Association, 535 North Dearborn Street, Chicago 10.

Articles are accepted for publication on condition that they are contributed solely to the ARCHIVES OF OTOLARYNGOLOGY. Manuscripts must be type written, preferably double spaced, and the original copy should be submitted. Zinc etchings and halftones will be supplied by the Association when the original illustrations warrant reproduction and when their number is not considered excessive.

Footnotes and bibliographies (the latter are used only in exhaustive reviews of the literature) should conform to the style of the *Quarterly Cumulative Index Medicus*. This requires, in the order given; name of author, title of article and name of periodical, with volume, page, month—day of month if the journal appears weekly—and year.

Matter appearing in the ARCHIVES OF OTOLARYNGOLOGY is covered by copyright, but as a rule no objection will be made to its reproduction in a reputable medical journal if proper credit is given. However, the reproduction for commercial purposes of articles appearing in the ARCHIVES OF OTOLARYNGOLOGY or in any of the other publications issued by the Association will not be permitted.

The ARCHIVES OF OTOLARYNGOLOGY is issued monthly. The annual subscription price (for two volumes) is as follows: domestic, $10.00; Canadian, $10.40; foreign, $11.00, including postage. Single copies are $1.00, postpaid.

Checks, money orders and drafts should be made payable to the American Medical Association.

OTHER PERIODICAL PUBLICATIONS
of the American Medical Association

THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION—Weekly. Covers all the medical sciences and matters of general medical interest. Illustrated. Annual subscription price (three volumes): domestic, $12.00; Canadian, $13.50; foreign, $16.00. Single copies, 35 cents.

ARCHIVES OF INTERNAL MEDICINE—Monthly. Devoted to the publication of advanced original clinical and laboratory investigations in internal medicine. Illustrated. Annual subscription price (two volumes): domestic, $8.00; Canadian, $8.40; foreign, $9.00. Single copies, 85 cents.

ARCHIVES OF NEUROLOGY AND PSYCHIATRY—Monthly. A medium for the presentation of original articles on nervous and mental diseases, with abstracts from foreign and domestic literature, book reviews, transactions of special societies, etc. Illustrated. Annual subscription price (two volumes): domestic, $10.00; Canadian, $10.40; foreign, $11.50. Single copies, $1.00.

ARCHIVES OF DERMATOLOGY AND SYPHILOLOGY—Monthly. Devoted to advancing the knowledge of and progress in cutaneous diseases and syphilis. Publishes original contributions and abstracts of the literature on these two subjects, transactions of the important dermatologic societies, book reviews, etc. Illustrated. Annual subscription price (two volumes): domestic, $10.00; Canadian, $10.40; foreign, $11.50. Single copies, $1.00.

AMERICAN JOURNAL OF DISEASES OF CHILDREN—Monthly. Presents pediatrics as a medical science and as a social problem. Includes carefully prepared reviews, based on recent pediatric literature, abstracts from foreign and domestic literature, book reviews, transactions of special societies, etc. Illustrated. Annual subscription price (two volumes): domestic, $10.00; Canadian, $10.40; foreign, $11.50. Single copies, $1.00.

ARCHIVES OF SURGERY—Monthly. Devoted largely to the investigative and clinical phases of surgery, with monthly reviews on orthopedic and urologic surgery. Well illustrated. Annual subscription price (two volumes): domestic, $10.00; Canadian, $10.40; foreign, $11.50. Single copies, $1.00, except special numbers.

ARCHIVES OF OPHTHALMOLOGY—Monthly. Includes original articles on diseases of the eye, abstracts from foreign and domestic literature, book reviews, transactions of special societies, etc. Illustrated. Annual subscription price (two volumes): domestic, $10.00; Canadian, $10.40; foreign, $11.00. Single copies, $1.00.

ARCHIVES OF PATHOLOGY—Monthly. A periodical devoted to the publication of original articles and general reviews in the field of pathology. Illustrated. Annual subscription price (two volumes): domestic, $6.00; Canadian, $6.40; foreign, $7.00. Single copies, 75 cents, except special issues.

QUARTERLY CUMULATIVE INDEX MEDICUS—Quarterly. A complete subject and author index to the worth while current medical literature of the world. Issued four times a year. Second and fourth volumes bound for permanent reference. Subscription price, calendar year: domestic, $15.00; Canadian, $17.00; foreign, $17.00.

AMERICAN MEDICAL ASSOCIATION

535 North Dearborn Street **CHICAGO 10**

CONTENTS

PAGE

Estrogen, Bone Metabolism and Otosclerosis. EDMUND PRINCE FOWLER, M.D., NEW YORK 637

Origin of the Caloric Reaction of the Labyrinth. L. B. W. JONGKEES, M.D., UTRECHT, NETHERLANDS 645

Clinical Test of a New Spray. THOMAS F. FURLONG JR., M.D., M.SC. (MED.), PHILADELPHIA 658

Tubular Wax Splints in Submucous Resection: Report of One Hundred and Fifty Cases. MAURICE SCHIFF, M.D., AND FRED HARBERT, M.D., PHILADELPHIA 662

Analysis of Results Obtained in the Labyrinth Fenestration Operation for Otosclerosis: Report of One Hundred Cases. EDWARD H. CAMPBELL, M.D., PHILADELPHIA 666

Suggested New Anatomic Classification of the Tympanic Spaces and Eustachian Tube: Draft of a New Clinical Classification on This Basis. ADOLF SCHWARZBART, M.D., TEL-AVIV, ISRAEL 681

CLINICAL NOTES; NEW INSTRUMENTS AND TECHNICS:

A New Esophagoscope. MARTIN HENRY, M.R.C.S., L.D.S., LONDON, ENGLAND 688

PROGRESS IN OTOLARYNGOLOGY. Summary of the Bibliographic Material Available in the Field of Otolaryngology:

Review of Allergy for 1946. E. L. MACQUIDDY, M.D., AND E. A. HOLYOKE, M.D., OMAHA 690

Peroral Endoscopy: Review of the Literature for 1947. LOUIS H. CLERF, M.D.; F. JOHNSON PUTNEY, M.D., AND J. J. O'KEEFE M.D., PHILADELPHIA 715

NEWS AND COMMENT 747

BOOK REVIEWS 747

ABSTRACTS FROM CURRENT LITERATURE 748

DIRECTORY OF OTOLARYNGOLOGIC SOCIETIES 752

GENERAL INDEX 753